VAISALA / TECHNOLOGY DESCRIPTION

Vaisala HUMICAP® Sensor for Measuring Relative Humidity

In 1973, Vaisala introduced HUMICAP®, the world's first thin-film capacitive humidity sensor. Since then, Vaisala has become the market leader in relative humidity measurements, and thin-film capacitive humidity sensors have developed from one company's innovation into a global industry standard.

Vaisala HUMICAP sensors guarantee quality and reliability, with their reputation for accuracy, excellent long-term stability, and negligible hysteresis.

How It Works

HUMICAP is a capacitive thin-film polymer sensor consisting of a substrate on which a thin film of polymer is deposited between two conductive electrodes. The sensing surface is coated with a porous metal electrode to protect it from contamination and exposure to condensation. The substrate is typically glass or ceramic.

The thin-film polymer either absorbs or releases water vapor as the relative humidity of the ambient air rises or falls. The dielectric properties of the polymer film depend on the amount of absorbed water. As the relative humidity around the sensor changes, the dielectric properties of the polymer film change, and so does the capacitance of the sensor. The instrument's electronics measure the capacitance of the sensor and convert it into a humidity reading.

Typical Applications for Humidity Measurement

Vaisala's humidity instruments with HUMICAP sensors are suitable for a wide range of applications. From power and steel to life sciences and building automation, many industries need to measure humidity – here are just a few:

Humidity must be measured and controlled in many drying processes, such as those in construction material and paper manufacturing, and fluid bed dryers. The humidity of the process air is a good indicator of the progression of the drying process.

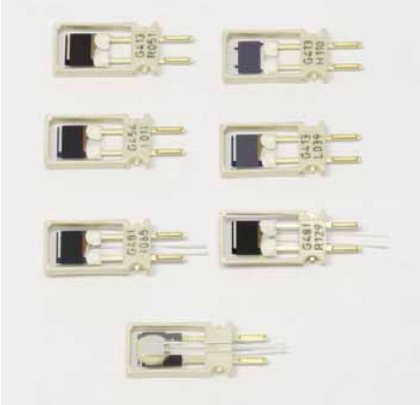
HUMICAP in Brief

- A capacitive thin-film polymer sensor
- Full measurement range 0...100 %RH
- Accurate to ±1 %RH
- Traceable humidity measurement
- Nearly 40 years on the market

HUMICAP's Unique Benefits

- Excellent long-term stability
- Insensitive to dust and most chemicals
- Chemical purge option for stable measurements in environments with high concentrations of chemicals
- Sensor heating for measurements even in condensing environments
- Full recovery from condensation

Cleanrooms and other critical environments also require high-performance environmental measurements in order to operate consistently and within



Family of HUMICAP sensors.

specifications. In addition, glove boxes and isolators – used for handling moisture or gas-sensitive materials – benefit from accurate and reliable humidity measurements. Measuring humidity in a critical environment can be especially challenging.

In the food industry the dryers and ovens used in bread baking and cereal manufacture require a carefully controlled humidity level to maintain consistent quality and high yield, and to give distinctive characteristics to the finished product.

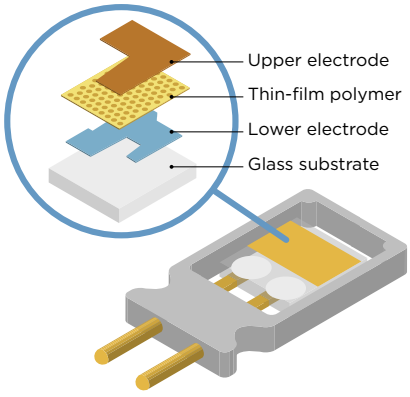
In building automation, optimizing both the temperature and relative humidity of the indoor environment enables a greater level of comfort for occupants than optimizing temperature alone. Careful humidity control is a must in museums, archives, warehouses, and other environments where humidity-sensitive materials are stored.

Vaisala HUMICAP Humidity Products

Vaisala has everything you need for measuring humidity, with a wide range of humidity instruments covering applications from HVAC to the most demanding industrial applications, both indoors and out. Vaisala's humidity instrument offering includes transmitters, modules for volume applications, portable and handheld humidity meters, and humidity calibrators. The full range of humidity products can be found at www.vaisala.com/humidity

Vaisala INTERCAP® Sensor

- Same measurement principle as in the HUMICAP® sensor
- Factory pre-calibrated - no additional calibration or adjustment needed
- Fully interchangeable
- Used in humidity instruments with ±3 %RH accuracy



Structure of the HUMICAP sensor.

HUMICAP® – The Story of Innovation

Until the early 1970s, hair hygrometers were commonly used in radiosondes. At that time, reliable humidity measurement was an unresolved challenge and to solve this, Vaisala began developing a new type of humidity sensor using semiconductors and thin-film materials. The revolutionary HUMICAP humidity sensor was introduced two years later, in 1973, at CIMO VI congress.

HUMICAP was a radical innovation that changed humidity measurements for good. The new technology was groundbreaking: the sensor had no moving parts, and due to the advanced use of semiconductor and thin-film technologies, it was amazingly small. The sensor had a fast response time, good linearity, low hysteresis, and small temperature coefficiency.

Despite the fact that the innovation was designed for a new type of a radiosonde, the greatest interest came from elsewhere: people working in environments as diverse as greenhouses, bakeries, warehouses, construction sites, brick and timber kilns, and museums. The need for reliable humidity measurement was common to all, and instruments that could do this accurately were few and far between.

By 1980, a variety of products based on HUMICAP technology – from hand-held meters to industrial transmitters, calibrators, and other accessories – were being sold in over 60 countries. Since its birth, HUMICAP has been part of Vaisala's core business, propelling the company to industry leadership in the field of humidity measurement.

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For more information, visit www.vaisala.com or contact us at sales@vaisala.com

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How to Choose the Right Instrument for Measuring Humidity and Dew Point

Learn the basics and get the best out of your humidity measurements.

Humidity measurement and control is called for in a wide variety of industrial applications. Each application has a different set of requirements for humidity instruments, such as required measurement range, tolerance to extreme temperature and pressure conditions, ability to recover from condensation, ability to operate in hazardous environments, and options for installation and calibration. There is no single device that is suitable for all needs. In fact, the range of available equipment is quite large, varying both in cost and quality.

This paper discusses the following topics in order to help in selecting the right humidity instrument:

- Different humidity parameters
- Environmental conditions that influence the choice of humidity instrument
- Sensor properties that influence the choice of humidity instrument
- Practical guidelines for selecting a humidity instrument

What is Humidity? An Introduction to Humidity Parameters

Partial Pressure of Water Vapor

Humidity is simply water in its gaseous phase, properly called water vapor. Because water vapor is a gas, most of the common gas laws apply to it, including Dalton's law of partial pressures. Dalton's law says that the total pressure of a gas is equal to the sum of the partial pressures of each of the component gases:

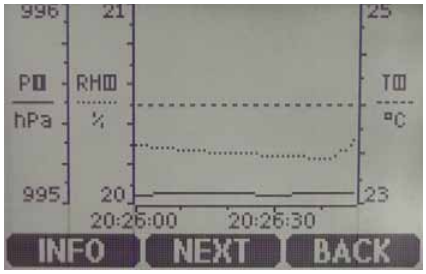
$$P_{total} = P_1 + P_2 + P_{3...}$$

If we consider air, the equation means that the total atmospheric pressure of 1.013 bar (14.7psia) is the sum of the partial pressures of nitrogen, oxygen, water vapor, argon, carbon dioxide, and various other gases in trace amounts.

Definition of Water Vapor Pressure

Water vapor pressure (P_w) is the pressure exerted by the water vapor present in air or a gas. Temperature dictates the maximum partial pressure of water vapor. This maximum pressure is known as saturation vapor pressure (P_{ws}). The higher the temperature, the higher the saturation vapor pressure and the more water vapor the air can hold. Thus, warm air has a greater capacity for water vapor than cold air.

If saturation vapor pressure is reached in air or in a gas mixture, the introduction of additional water vapor requires that an equal amount condenses out of the gas as a liquid or a solid. A psychrometric chart shows graphically the relation between saturation vapor pressure and temperature. In addition, vapor pressure tables can be used to see the saturation vapor pressure at any temperature, and there are also a number of computer-based calculation programs available.



Some humidity measurement instruments allow an individual humidity parameter to be chosen which can then be followed on a graphical display. This picture shows different views of the Vaisala HUMICAP Hand-Held Humidity and Temperature Meter HM70 display.

Effect of Pressure on Humidity

Dalton's law states that a change in the total pressure of a gas must have an effect on the partial pressures of all of the component gases, including water vapor. If, for example, the total pressure is doubled, the partial pressures of all component gases are doubled as well. In air compressors, a pressure increase "squeezes" water out of the air as it is compressed.

Humidity calculators are also available for mobile phones.

This happens because the partial pressure of water vapor (P_w) is increased, but the saturation vapor pressure is still only a function of temperature. As pressure builds in a receiver tank and P_w reaches P_{ws}, water condenses into liquid and must ultimately be drained from the tank.

Relative Humidity

When thinking conceptually of water vapor as a gas, it's easy to define relative humidity. Relative humidity (RH) can be defined as the ratio of the partial water vapor pressure (P_w) to the water vapor saturation pressure (P_{ws}) at a particular temperature:

$$\%RH = 100\% \times P_w / P_{ws}$$

Relative humidity is strongly temperature dependent as the denominator in the definition (P_{ws}) is a function of temperature. For example, in a room with an RH of 50% and a temperature of 20°C, increasing the temperature of the room to 25°C will decrease the RH to about 37%, even though the partial pressure of the water vapor remains the same.

Pressure will also change relative humidity. For example, if a process is kept at a constant temperature, relative humidity will increase by a factor of two if the process pressure is doubled.

Dew Point Temperature

If a gas is cooled and gaseous water vapor begins to condense in the liquid phase, the temperature at which condensation occurs is defined as the dew point temperature (T_d). At 100%RH the ambient temperature equals the dew point temperature. The further negative the dew point is from the ambient temperature, the smaller the risk for condensation and the drier the air.

Dew point directly correlates with saturation vapor pressure (P_{ws}). The partial pressure of water vapor associated with any dew point can be easily calculated. Unlike RH, dew point is not temperature dependent but it is affected by pressure. Typical applications for dew point measurement include various drying processes, dry air applications, and compressed air drying.

Frost Point Temperature

If the dew point temperature is below freezing – which is the case in dry gas applications – the term frost point (T_f) is sometimes used to explicitly state that the condensing phase is ice. The frost point is always slightly higher than the dew point below 0°C as the water vapor saturation pressure of ice is different to water. People also often refer to dew point for subzero values, even though they mean frost point. Ask for clarification if you are not certain.

Parts Per Million

Unit parts per million (ppm) is sometimes used for low levels of humidity. It is the ratio of water vapor to dry gas or total (moist) gas, and is expressed either by volume/volume (ppm_{vol}) or mass/weight (ppm_w). Parts per million (ppm_{vol}) can be quantitatively expressed as follows:

$$ppm_{vol} = [P_w /(P - P_{ws})] \times 10^6$$

The ppm parameter is typically used when defining the water vapor content of pressurized and dry pure gases.

Mixing Ratio

The mixing ratio (x) is the ratio of water vapor mass to the mass of dry gas. It is dimensionless but often expressed in grams per kilogram of dry air. The mixing ratio is mainly used in drying processes and HVAC applications for calculating water content when the mass flow of air is known.

Wet Bulb Temperature

Traditionally, the wet bulb temperature (T_w) is the temperature indicated by a thermometer wrapped in a wet cotton sheath. The wet bulb and ambient temperatures can be used together to calculate relative humidity or dew point. For example, the wet bulb temperature is used in air conditioning applications where it is compared to the dry bulb temperature to determine the cooling capacity of evaporative coolers.

Absolute Humidity

Absolute humidity (a) refers to the mass of water in a unit volume of moist air at a given temperature and pressure. It is usually expressed as grams per cubic meter of air. Absolute humidity is a typical parameter in process control and drying applications.

Water Activity

Water activity (aw) is similar to equilibrium relative humidity and uses a scale of 0 to 1, instead of 0% to 100%.

Enthalpy

Enthalpy is the amount of energy required to bring a gas to its current state from a dry gas at 0°C. It is used in air conditioning calculations.

The Effect of Environmental Conditions on Humidity Measurement

Environmental conditions can have a significant effect on humidity and dew point measurements. Take the following environmental factors into consideration to achieve the best possible measurement result:

Select a Representative Measurement Location

Always choose a measuring point that is representative of the environment being measured, avoiding any hot or cold spots. A transmitter mounted near a door, humidifier, heat source, or air conditioning inlet will be subject to rapid humidity changes and may appear unstable.

As relative humidity is strongly temperature dependent, it is very important that the humidity sensor is at the same temperature as the measured air or gas. When comparing the humidity readings of two different instruments, the thermal equilibrium between the units/probes and the measured gas is particularly crucial.

Unlike relative humidity, dew point measurement is independent of temperature. However, when measuring dew point, pressure conditions must be taken into account.

Beware of Temperature Differences

When mounting a humidity probe into a process, avoid temperature drops along the probe body. When there is a large temperature difference between the probe and the external environment, the whole probe should be mounted within the process and the cable entry point should be insulated.

When there is a risk of condensation, the probe should be mounted horizontally to avoid water dripping down the probe/cable and saturating the filter (see figure 1).

Ensure that air is allowed to flow around the sensor. Free air flow ensures that the sensor is in equilibrium with the process temperature. At 20°C and 50%RH, 1°C difference between the sensor and the measurement zone will cause an error of 3%RH. At 100%RH the error is 6%RH (see figure 2).

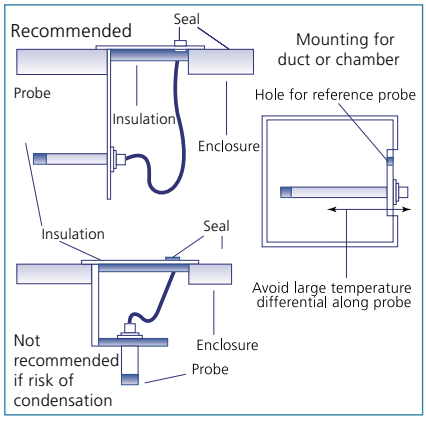


Figure 1: *Mounting a humidity probe in a condensing environment.*

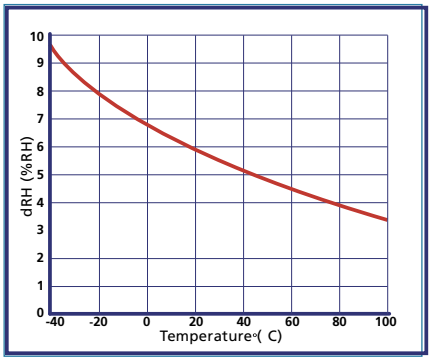


Figure 2: *Measurement error at 100%RH at various temperatures when the temperature difference between the ambient air and the sensor is 1°C.*

The Right Instrument for High Humidity

Environments with >90%RH are defined here as high humidity environments. At 90%RH a difference of 2°C can cause water to condense on the sensor, which in an unventilated space may take hours to dry. Vaisala humidity sensors will recover from condensation. However, if the condensed water is contaminated, the instrument accuracy can be affected due to deposits on the sensor, especially salt deposits. Even the life of the sensor may be shortened. In applications with high humidity where condensation can occur, a warmed sensor head probe such as the Vaisala HUMICAP® Humidity and Temperature Transmitter HMT337 should be used.

The Right Instrument for Low Humidity

Environments with <10%RH are defined here as low humidity environments. At low humidities, the calibration accuracy of instruments measuring relative humidity may not be adequate. Instead, measuring dew point will provide a good indication of humidity. For example, Vaisala DRYCAP® products are designed for measuring dew point.

If a dryer fails in a compressed air system, water condensation may appear and the instrument will need to recover. Many dew point sensors are damaged or destroyed in such situations, but Vaisala DRYCAP® dew point sensors withstand high humidity – and even water spikes.

The Right Instrument for Extreme Temperature and Pressure Conditions

Continuous exposure to extreme temperatures may affect sensor and probe materials over time. It is therefore very important to select a suitable product for demanding environments. In temperatures above 60°C the transmitter electronics should be mounted outside the process and only a suitable high temperature probe should be inserted into the high temperature environment. Moreover, built-in temperature compensation is required to minimize the errors caused by large temperature swings or operation at temperature extremes.

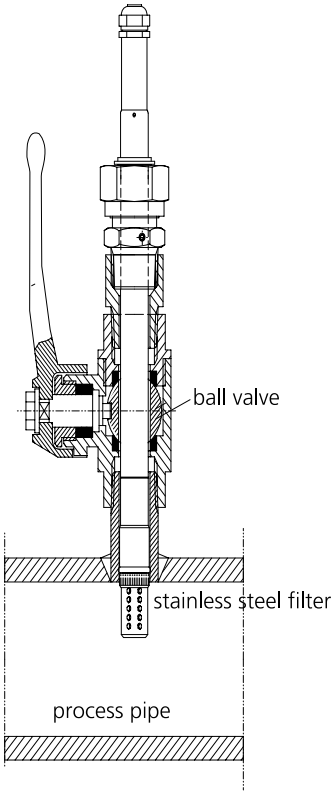


Figure 3: *A ball valve installation in a process pipe line.*

When measuring humidity in processes operating at around ambient pressure, a small leak may be tolerable and can be reduced by sealing around the probe or cable. However, when the process needs to be isolated, or when there is a large pressure difference between the process and the external environment, a sealed probe head with appropriate mounting must be used. Pressure leaks at the point of entry will alter the local humidity and result in false readings.

In many applications it is advisable to isolate the probe from the process with a ball valve to enable the removal of the probe for maintenance without shutting down the process (see figure 3).

When is a Sampling System Needed for Dew Point Measurement?

Wherever possible, the probe should be mounted in the actual process to achieve the most accurate measurements and a rapid response time. However, direct installations are not always feasible. In such situations, sample cells installed in-line provide an entry point for a suitable measurement probe.

Note that external sampling systems should not be used to measure relative humidity because the change in temperature will affect the measurement. Sampling systems can instead be used with dew point probes. When measuring dew point, sampling systems are typically used to lower the temperature of the process gas, to protect the probe against particulate contamination, or to enable easy connection and disconnection of the instrument without ramping down the process.

The simplest dew point sampling setup consists of a dew point transmitter connected to a sampling cell. Vaisala has several models suitable for the most common applications and sampling needs. For example, the easy to install DSC74 sampling cell is designed for the flow and pressure conditions in compressed air applications.

In demanding process conditions, sampling systems must be designed carefully. As dew point is pressure dependent, a flow meter, pressure gauge, special non-porous tubing, filters, and pump may be needed. As an example, a flow chart showing the Vaisala DRYCAP® Portable Sampling System DSS70A for DM70 is shown in figure 4.

In a pressurized system a sample pump isn't needed as the process pressure induces a large enough flow to the sampling cell.

When measuring dew point with a sampling system, trace heating should be used when the ambient temperature around the cooling coil or connecting tube is within 10°C of the dew point temperature. This prevents condensation in the tubing that connects the dew point instrument to the process.

Hazardous Environments

Only products with appropriate certification can be used in potentially explosive areas. For example, in Europe products must comply with the ATEX100a directive, which has been mandatory since 2003. Intrinsically safe products are designed in such a manner that even in the event of failure they do not generate enough energy to ignite certain classes of gas. The wiring from the intrinsically safe product into the safe area must be isolated via a safety barrier. For example, the Vaisala HMT360 series of intrinsically safe humidity transmitters are specially designed for use in hazardous environments.

Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMT360 is designed for hazardous and explosive environments.

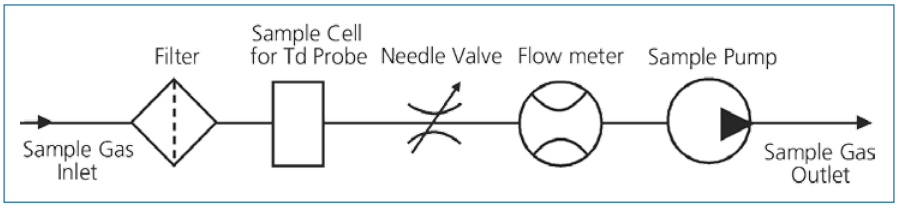


Figure 4: *The DSS70A sampling system includes a filter to clean the gas and a needle valve to control the sample flow rate. A sample pump is needed to generate flow from an unpressurized process gas.*

Shock and Vibration

When the probe will be subject to excessive shock or vibration, the choice of probe, mounting method, and installation location needs careful consideration.

What Makes a Good Humidity Sensor?

Humidity sensor performance is a critical contributor to the overall quality of the humidity measurement. Consider the importance of the following sensor properties:

Fast Response Time

The sensor response time is the speed of response when the sensor is subjected to a step change in humidity. In addition to the sensor, factors such as temperature, airflow, and filter type all have an effect on response time. A blocked filter will give a slower response.

Optimal Measurement Range

The choice of humidity sensor depends on the application and operating temperature, especially at the extremes of humidity.

The majority of Vaisala's humidity sensors work over the full range from 0 to 100%RH. Vaisala HUMICAP® sensors are the optimal choice for applications with a relative humidity around 10–100%RH, whereas DRYCAP® sensors are designed for measurements in low humidities around 0–10%RH.

Good Chemical Tolerance

Aggressive chemicals can damage or contaminate sensors. The instrument manufacturer should know the effects of various chemicals on their sensors and be able to give advice related to acceptable chemical concentrations.

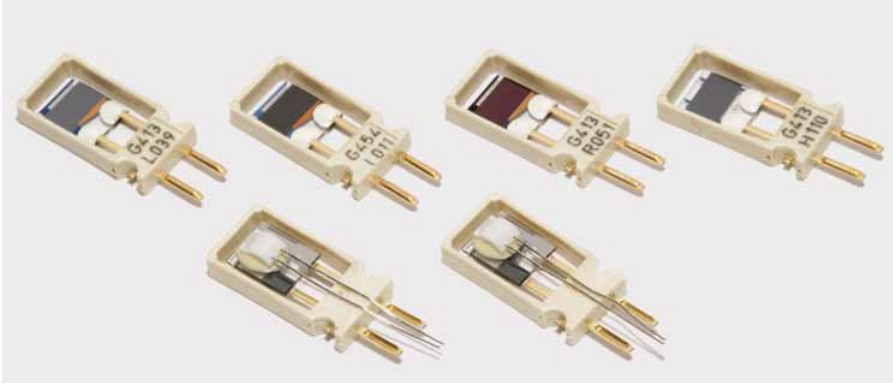
High Accuracy

Accuracy as a term is well established, but difficult to define. Each step in the calibration chain – from the primary standard in an internationally recognized calibration laboratory, to the actual product

manufacture and the measurement on site – introduces measurement error. The sum of these potential errors is the uncertainty of the measurement.

When selecting a humidity sensor, consider the following factors associated with accuracy:

- Linearity over the working range
- Hysteresis and repeatability
- Stability over a period of time
- Temperature dependence of the sensor



Humidity sensors from Vaisala.

During manufacture, Vaisala products are compared and adjusted against factory standards that are directly traceable to internationally recognized standards. The calibration chain is detailed in the certificates that are supplied with the majority of Vaisala products.

The Right Humidity Instrument for the Job

Protective filters for Vaisala's humidity instruments.

No matter what the application, the total range of gas temperatures and expected water vapor levels must be known in order to decide the optimal humidity parameters and the optimal instrument for the environment. The process pressure must also be known when measuring humidity within the process. In addition, it must be decided whether to make the measurement at the process pressure or at some other pressure. For gases other than air, the gas composition must be known.

The terms probe, transmitter, and sensor describe products that measure humidity. The probe is the part of the product that contains the humidity sensor. The probe may be rigidly bound to the transmitter or connected with a flexible cable. The transmitter provides the output signal.

Vaisala designs and manufactures a range of products for measuring relative humidity, temperature, and dew point based on HUMICAP® and DRYCAP® sensors. All Vaisala humidity instruments feature built-in temperature compensation to minimize the errors caused by temperature variations and operation at extremes of temperature. Many of the products include built-in calculations for other humidity parameters.

Protect the Sensor and Electronics with the Right Filter

As well as screening the sensor from any stray electromagnetic fields, the filter protects the sensor from dust, dirt, and mechanical stress. A membrane or netting filter is a good alternative for the majority of applications. In temperatures above 80°C, in high pressure, or in rapidly moving air up to 75 m/sec, a sintered filter should be used.

A suitable protective enclosure protects the instrument electronics from dust, dirt, and excessive humidity. An enclosure with an IP65 or NEMA 4 classification gives good protection against dust and sprayed water. The cable entry points need to be sealed during installation.

When using the instrument outside, it should be mounted in a radiation shield or Stevenson screen to prevent solar radiation or extremes of weather from affecting the measurement.

Must the Instrument Tolerate Condensation?

Making good quality humidity measurements in near-condensing conditions is very challenging. Warmed probe technology ensures reliable measurements when measuring relative humidity close to saturation point. The humidity level of the warmed probe always stays below the ambient level, where condensation occurs.

Must the Instrument Withstand Exposure to Chemicals?

A chemical purge feature helps to maintain measurement accuracy in environments with a high concentration of chemicals or

cleaning agents. The chemical purge heats the sensor at regular intervals to remove chemicals that may have accumulated over time.

The Importance of Electromagnetic Compatibility (EMC)

There are many standards defining the ability of products to withstand external electrical interference. In addition, the product must not generate emissions that can cause interference to sensitive equipment. Industrial applications have more demanding EMC requirements than HVAC installations – the CE marking used in Europe guarantees compliance.

Consider Wiring and Earthing

Except for short cable runs, a screened cable is recommended. Proximity to high-voltage cables or RF sources should be avoided. It is good practice to earth the connection cable screen at a common point and avoid multiple earth points. Galvanic isolation is also available on some Vaisala products.

Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMT330 is a flexible product family designed for demanding industrial applications.

Which Power Supply and Output Signals are Needed?

The majority of measurement instruments are powered using a low voltage supply. If a low voltage AC supply is used, an isolated supply is recommended for each transmitter to avoid earth loops or interference from an inductive load.

Analog output instruments usually have an option for both voltage and current outputs. The choice depends on the length of the signal path and on the interfacing equipment. Some products have a 4–20mA loop power connection, which is a 2-wire system where the output signal current is measured in the supply line.

In addition to analog outputs, some Vaisala products feature digital communication via RS-232, RS-485, or LAN/WLAN interfaces. Selected commercial protocols (Modbus, BACnet) are also available.

Consider Calibration before Purchasing

Instruments typically need to be calibrated every year or every second year. Calibration requirements depend on the application and the stability of the instrument, with wide variations in how easy it is to carry out field checking and calibration. Some instruments need to be sent to a laboratory for calibration, for example. Understanding the calibration needs is therefore an important part of instrument selection.

Calibration Frequency

An individual calibration certificate for a particular instrument indicates the accuracy and linearity at the time of calibration. However, it does not reflect the stability of the instrument in the long run. Calibration at routine intervals is essential to understand the instrument's long-term stability.

Calibration frequency depends on the operating environment. A rule of thumb for Vaisala instruments is that yearly calibration is enough for HUMICAP® products, whereas in most applications a two-year calibration interval is suitable for DRYCAP® products. When measuring in constant high humidity (>85%RH), high temperature (>120°C), or chemically aggressive atmospheres, more frequent checks may be needed.

On-site calibration of a HMW90 humidity transmitter with a HM70 hand-held meter.

Humidity Instrument Calibration

In calibration, the humidity reading of an instrument is compared against a portable reference. The reference should be regularly calibrated and provided with a valid certificate. When selecting one of the many calibration methods, time, cost, technical requirements, expertise, and the unique needs of the organization must be balanced.

Portable meters and products that can be removed from the installation can be calibrated in an approved laboratory or returned to the instrument provider for calibration. Vaisala has four Service Centers around the world available for calibration.

Instruments installed in processes that operate within narrow boundaries can be calibrated using on-site one-point calibration that can be performed without disconnecting the instrument. One-point calibration can also be used to identify the need for further calibration and adjustment.

Some portables such as the Vaisala HUMICAP® Hand-Held Humidity and Temperature Meter HM70 or the Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70 can be directly connected to the installed product and the readings compared to those on the portable meter's display.

In environments with large variations in humidity, multi-point calibration is recommended. Two-point or three-point calibrations can be accomplished in the field with the help of humidity-generating equipment, as long as the local environment is at a stable temperature. The advantage of multi-point calibration compared to one-point calibration is higher accuracy over the entire measurement range. Multiple humidity levels can be created with the Vaisala Humidity Calibrator HMK15, for example.

Vaisala Humidity Calibrator HMK15 for multi-point on-site calibrations.

Calibration of Dew Point Instruments

It is a demanding task to perform high-quality calibrations on low dew point instruments. For this reason, Vaisala doesn't recommend customers perform calibrations on Vaisala DRYCAP® products. Instead, they should be calibrated in professional calibration laboratories, such as Vaisala Service Centers. However, it is possible to perform a field check on a dew point instrument to identify whether adjustment is needed, using the Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70.

To learn more about Vaisala's humidity instruments, visit www.vaisala.com/humidity.

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HMT330 Series Humidity and Temperature Transmitters for Demanding Humidity Measurement

The HMT330 transmitter family offers reliable performance for a wide variety of demanding industrial humidity measurements.

Features/Benefits

- Six models for demanding industrial applications
- Full 0 ... 100 %RH measurement, temperature range up to +180 °C (+356 °F) depending on model
- Pressure tolerance up to 100 bar depending on model
- 4th generation Vaisala HUMICAP® sensor for superior accuracy and stability
- Graphical display and keypad for convenient operation
- Multilingual user interface
- Excellent performance in harsh conditions; good chemical tolerance
- Corrosion-resistant IP65/IP66 housing
- NIST traceable calibration (certificate included)
- Analog outputs, RS232/485, WLAN/LAN
- MODBUS protocol support (RTU/TCP)
- Compatible with Vaisala viewLinc software

The Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMT330 is designed for demanding industrial applications where stable measurements and extensive customization are essential. With multiple options to choose from, the instrument can be tailored to meet the specific needs of each individual application.

Proven Vaisala HUMICAP® Performance

The HMT330 series incorporates Vaisala's 40 years of experience in industrial humidity measurement. The updated fourth-generation HUMICAP sensor provides accurate and stable measurement even in environments with high humidity or chemical contaminants.

Chemical Purge Minimizes Effects of Contaminants

In environments with high concentrations of chemicals and cleaning agents, the chemical purge option helps to maintain measurement accuracy between calibration intervals.

The chemical purge involves heating the sensor to remove harmful chemicals. The function can be initiated manually or programmed to occur at set intervals.

Wide Range of Installation Options

The wide variety of measurement probes, several installation accessories, and universal mains and DC power options make the instruments easy to install in various locations and kinds of environment; walls, poles, pipelines, and ducts, for example. The input/output cable can be fed through the back of the transmitter, which is a useful feature, especially for cleanroom installations.

The HMT330 series includes six models:

- HMT331 for wall-mounted applications
- HMT333 for ducts and tight spaces
- HMT334 for high-pressure and vacuum applications
- HMT335 for high-temperature applications
- HMT337 for high-humidity applications
- HMT338 for pressurized pipelines

Graphical Display of Measurement Data and Trends for Convenient Operation

The HMT330 series features a large numerical and graphical display with a multilingual menu and keypad. It allows users to easily monitor operational data, measurement trends, and access measurement history for the past 12 months.

The optional data logger, with real-time clock, makes it possible to generate over four years of measurement history, and zoom in on any desired time or time frame.

The display alarm allows any measured parameter to be tracked, with freely configurable low and high limits.

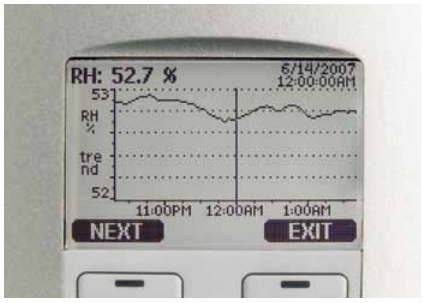
Versatile Outputs and Data Collection

The HMT330 can support up to three analog outputs; an isolated galvanic power supply and relay outputs are also available.

For serial interface the USB connection, RS232, and RS485 can be used.

HMT330 is also capable of applying the MODBUS communication protocol and, together with an appropriate connection option, provides either MODBUS RTU (RS485) or MODBUS TCP/IP (Ethernet) communication.

The data logger, with real-time clock and battery backup, guarantees reliable logging of measurement data for over four years. The recorded data can be viewed on the local display or transferred to a PC with Microsoft Windows® software. The transmitter can also be connected to a network with an optional (W)LAN interface, which enables a (wireless) Ethernet connection. A USB service cable makes it easy to connect the HMT330 to a PC via the service port.



The display shows measurement trends and over four years of real-time measurement history.

Flexible Calibration

The HMT330 instruments are calibrated at six humidity points at the factory and come with a calibration certificate that meets all the relevant traceability and compliance requirements.

A quick, one-point field calibration can be performed with the hand-held HM70 meter. A two-point field calibration can be performed, for example, with the HMK15 salt bath calibrator in a controlled environment. The transmitter can also be sent to Vaisala for recalibration, and accredited calibrations are available.

Technical Data

Performance

RELATIVE HUMIDITY

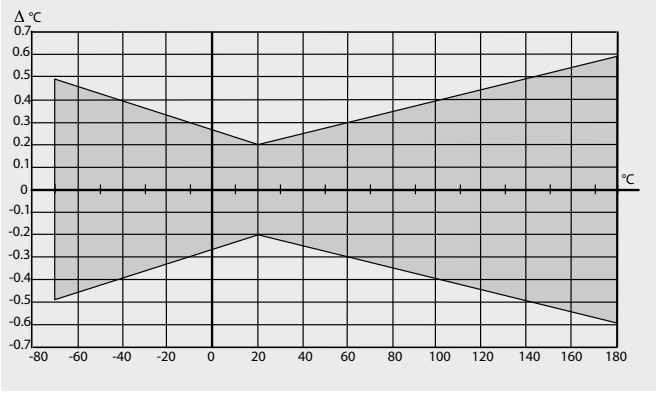
Measurement range	0 ... 100 %RH
Accuracy (including non-linearity, hysteresis, and repeatability)	
with Vaisala HUMICAP® 180 or 180R*	for typical applications
with Vaisala HUMICAP® 180C or 180RC*	for applications with chemical purge/warmed probe
at +15 ... +25 °C (59 ... +77 °F)	±1 %RH (0 ... 90 %) ±1.7 %RH (90 ... 100 %RH)
at -20 ... +40 °C (-4 ... +104 °F)	±(1.0 + 0.008 x reading) %RH
at -40 ... +180 °C (-40 ... +356 °F)	±(1.5 + 0.015 x reading) %RH
Factory calibration uncertainty (+20 °C)	±0.6 %RH (0 ... 40 %RH) ±1.0 %RH (40 ... 97 %RH) (Defined as ±2 standard deviation limits. Small variations possible; see also calibration certificate.)
Response time (90%) at +20 °C (+68 °F)	8 s/17 s** with grid filter
in still air	20 s/50 s** with grid + steel netting filter 40 s/60 s** with sintered filter

*HUMICAP 180R or 180RC recommended

**with HUMICAP 180R or 180RC sensor

TEMPERATURE

Accuracy at +20 °C (+68 °F)	± 0.2 °C (± 0.36 °F)
Accuracy over temperature range (measurement range depends on model)	



Temperature sensor	Pt100 RTD Class F0.1 IEC 60751

Other available variables (model-dependent)

dew point temperature, mixing ratio, absolute humidity, wet bulb temperature, enthalpy, water vapor pressure

Inputs and Outputs

Operating voltage	10 ... 35 VDC, 24 VAC ±20%
with optional power supply module	100 ... 240 VAC, 50/60 HZ
Power consumption at +20 °C (U_{in} 24 VDC)	
RS232	max. 25 mA
U_{out} 2 x 0 ... 1 V/0 ... 5 V/0 ... 10 V	max. 25 mA
I_{out} 2 x 0 ... 20 mA	max. 60 mA
display and backlight	+ 20 mA
during chemical purge	max. 110 mA
during probe heating (HMT337)	+ 120 mA
Analog outputs (2 standard, 3rd optional)	
current output	0 ... 20 mA, 4 ... 20 mA
voltage output	0... 1 V, 0... 5 V, 0... 10 V
Accuracy of analog outputs at +20 °C	±0.05% full scale
Temperature dependence of the analog outputs	±0.005%/°C full scale
External loads	
current outputs	R_L < 500 ohm
0 ... 1 V output	R_L > 2 kohm
0 ... 5 V and 0 ... 10 V outputs	R_L > 10 kohm
Max. wire size	0.5 mm^2 (AWG 20) stranded wires recommended
Digital outputs	RS232, RS485 (optional)
Protocols	ASCII commands, MODBUS RTU
Service connection	RS232, USB
Relay outputs (optional)	0.5 A, 250 VAC
Ethernet interface (optional)	
Supported standards	10BASE-T, 100BASE-TX
Connector	8P8C (RJ45)
IPv4 address assignment	DHCP (automatic), static
Protocols	Telnet, MODBUS TCP/IP
WLAN interface (optional)	
Supported standards	802.11b
Antenna connector type	RP-SMA
IPv4 address assignment	DHCP (automatic), static
Protocols	Telnet, MODBUS TCP/IP
Security	WEP 64/128, WPA2/802.11i
Authentication / Encryption (WLAN)	
Open / no encryption	
Open / WEP	
WPA Pre-shared key / TKIP	
WPA Pre-shared key / CCMP (a.k.a. WPA2)	
Optional data logger with real-time clock	
Logged parameters	max. four with trend/min/max values
Logging interval	10 sec. (fixed)
Max. logging period	4 years, 5 months
Logged points	13.7 million points per parameter
Battery lifetime	min. 5 years
Display	LCD with backlight, graphical trend display of any parameter
Menu languages	English, Chinese, Finnish, French, German, Japanese, Russian, Spanish, Swedish

Mechanics

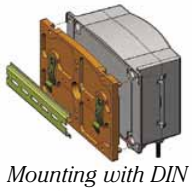
Cable bushing	M20 x 1.5 for cable diameter 8 ... 11 mm/0.31 ... 0.43"
Conduit fitting	1/2" NPT
User cable connector (optional)	M12 series 8-pin (male)
option 1	female plug with 5 m (16.4 ft.) black cable
option 2	female plug with screw terminals
Probe cable diameter	
HMT333 (+80 °C)	6.0 mm
other probes	5.5 mm
Standard probe cable lengths	2 m, 5 m or 10 m (Additional lengths available, please see order forms for details)
Housing material	G-AlSi 10 Mg (DIN1725)
Housing classification	IP 66 IP65 (NEMA4X) with local display
Weight depending on selected probe, cable and modules	1.0 - 3.0 kgs

Operating Environment

Operating temperature	
for probe	same as measurement range
for transmitter body	-40 ... +60 °C (-40 ... 140 °F)
with display	0 ... +60 °C (32 ... 140 °F)
Electromagnetic compatibility	Complies with EMC standard EN61326-1, Industrial Environment
	Note: Transmitter with display test impedance of 40 ohm is used in IEC61000-4-5 (Surge immunity)

Mounting Options

*Mounting with Wall Mounting Kit**



Mounting with DIN Rail Installation Kit

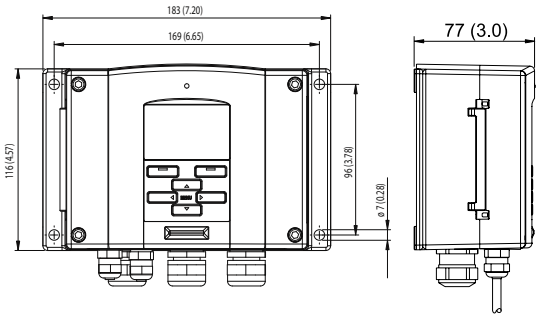
Pole Installation with Installation Kit for Pole or Pipeline

Mounting Rain Shield with Installation Kit

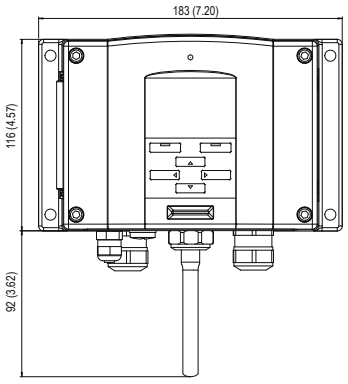
*not mandatory for wall installations

Dimensions

Dimensions in mm (inches)



Transmitter with WLAN antenna



TYPE APPROVED PRODUCT
CERTIFICATE NO.: A-13529

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HMT331 Humidity and Temperature Transmitter for Demanding Wall-Mounted Applications

The HMT331 is a state-of-the-art wall-mounted humidity measurement instrument.

The Vaisala HUMICAP® Humidity and Temperature Transmitter HMT331 is a high-quality wall-mounted transmitter for demanding HVAC and condition-monitoring applications.

Typical Applications

- cleanrooms
- pharmaceutical processes
- swimming halls
- museums and archives

HMT331 Humidity and Temperature Transmitter with short flexible probe and optional WLAN.

Technical Data

Temperature measurement range	-40 ... +60 °C (-40 ... +140 °F)

Accessories

USB service port cable with PC software	219916
Connection cable for HM70	211339
Wall-mounting plate (plastic)	214829
Pole installation kit with rain shield	215109
DIN rail installation set	215094
PPS plastic grid filter with stainless steel net	DRW010281SP
Stainless steel sintered filter	HM47280SP

HMT333 Humidity and Temperature Transmitter for Ducts and Tight Spaces

The Vaisala HUMICAP® Humidity and Temperature Transmitter HMT333 is a versatile instrument for applications where a small remote probe is needed, for example in demanding HVAC applications. Its small thermal mass enables rapid response to temperature changes.

The HMT333 transmitter's compact probe is designed for remote applications.

Flexible Installation

To install the probe in ducts, channels, and through walls, an installation kit is available with a stainless steel flange, lead-through piece, and steel support bar.

The HMT333 has two probe cable options – a flexible rubber cable that withstands temperatures of up to +80 °C, and a durable cable that withstands temperatures of up to +120 °C. Both cable options are available in lengths of 2, 5, and 10 meters. Additionally, flexible rubber cable (+80 °C) is available in 20-meter lengths.

For outdoor environments, the DTR502B solar radiation shield provides protection for the probe. The shield can be installed on a pole, beam, or flat surface.

Typical Applications

- cleanrooms
- pharmaceutical processes
- environmental chambers
- processes with moderate temperature and humidity

Duct installation kit for HMT333 and HMT337.

Technical Data

Temperature measurement range	-40 ... +80 °C (-40 ... +176 °F) or -40 ... +120 °C (-40 ... +248 °F)

Accessories

Duct installation kit	210697
Cable gland with split seal	HMP247CG
USB service port cable with PC software	219916
Connection cable for HM70	211339
Wall-mounting plate (plastic)	214829
Pole installation kit with rain shield	215109
Solar radiation shield	DTR502B
DIN rail installation set	215094
PPS plastic grid filter with stainless steel net	DRW010281SP
PPS plastic grid filter	DRW010276SP
Stainless steel sintered filter	HM47280SP

HMT334 Humidity and Temperature Transmitter for High Pressure and Vacuum Applications

The HMT334 is ideal for permanent installations in pressurized or vacuum processes.

The Vaisala HUMICAP® Humidity and Temperature Transmitter HMT334 is designed for humidity measurement in pressurized spaces or vacuum chambers. Every probe is tested for gas and vacuum-tight installation.

Typical Applications

- test chambers
- high-pressure and vacuum processes

Technical Data

Temperature measurement range	-70 ... +180 °C (-94 ... +356 °F)
Operating pressure	0 ... 10 MPa (0 ... 100 bar)

Accessories

Fitting body ISO M22 x 1.5	17223SP
Fitting body NPT 1/2"	17225SP
USB service port cable with PC software	219916
Connection cable for HM70	211339
Wall-mounting plate (plastic)	214829
Pole installation kit with rain shield	215109
DIN rail installation set	215094
PPS plastic grid filter with stainless steel net	DRW010281SP
PPS plastic grid filter	DRW010276SP
Stainless steel sintered filter	HM47280SP
Stainless steel grid filter	HM47453SP

HMT335 Humidity and Temperature Transmitter for High Temperatures

The HMT335 has a robust stainless steel probe, ideal for hot processes with high flow rates.

The Vaisala HUMICAP® Humidity and Temperature Transmitter HMT335 has a long stainless steel probe designed for high temperatures.

Robust Probe Ideal for High Flow Rates

With high tolerance for mechanical stress and high flow rates, the HMT335 is ideal for duct measurements. The stainless steel installation flange allows easy adjustment of the probe's installation depth.

Typical Applications

- hot drying processes
- food processes, e.g. baking ovens

The installation flange allows easy adjustment of the probe installation depth.

Technical Data

Temperature measurement range	-70 ... +180 °C (-94 ... +356 °F)

Accessories

Mounting flange	210696
USB service port cable with PC software	219916
Connection cable for HM70	211339
Wall-mounting plate (plastic)	214829
Pole installation kit with rain shield	215109
DIN rail installation set	215094
PPS plastic grid filter with stainless steel net	DRW010281SP
PPS plastic grid filter	DRW010276SP
Stainless steel sintered filter	HM47280SP
Stainless steel grid filter	HM47453SP

HMT337 Humidity and Temperature Transmitter for High Humidity Applications

The HMT337 is ideal for the most demanding process and meteorological measurements in high-humidity condensing environments.

Typical Applications

- professional meteorology
- intake air monitoring of engines and gas turbines
- timber drying kilns

Duct installation kit for HMT333 and HMT337.

The Vaisala HUMICAP® Humidity and Temperature Transmitter HMT337 is delivered in one of three configurations:

- Basic, with a non-warmed probe for moderate humidity
- With a warmed probe, for near-condensing conditions and dew point measurement
- With a warmed probe and an additional temperature sensor, for near-condensing conditions and relative humidity measurement

True Humidity Readings in Condensation Conditions

Vaisala's unique warmed probe provides fast and reliable measurement in environments where humidity is near saturation. The heating prevents condensation from forming on the sensor.

As the probe is heated, the humidity level inside it stays below the ambient level. With accurate temperature measurement, the ambient dew point can be calculated precisely.

If the relative humidity value is needed, an additional temperature sensor is used. The measured ambient temperature provides the compensation for calculating relative humidity and other humidity parameters.

Installation Options

Tight installation through a process wall can be achieved with Swagelok® fittings. The optional HMT330MIK Installation Kit is available for outdoor installations; duct installation kits are also available.

Technical Data

Temperature measurement range	-70 ... +180 °C (-94 ... +356 °F)

Accessories*

Cable gland and AGRO	HMP247CG
Duct installation kit (RH probe)	210697
Duct installation kit (T probe)	215003
Swagelok fittings (NPT and ISO) for both RH and T probes (up to 10 bar)	
Solar radiation shield	DTR502B
Meterological installation kit	HMT330MIK
USB service port cable with PC software	219916
Connection cable for HM70	211339
Wall-mounting plate (plastic)	214829
Pole installation kit with rain shield	215109
DIN rail installation set	215094
Warmed probe accessory	HMT330WPA
PPS plastic grid filter with stainless steel net	DRW010281SP
PPS plastic grid filter	DRW010276SP
Stainless steel sintered filter	HM47280SP
Stainless steel grid filter	HM47453SP

*for more installation accessories, check the order form

HMT338 Humidity and Temperature Transmitter for Pressurized Pipelines

The HMT338 is ideal for installations in pressurized processes where the probe needs to be removed while the process is running.

Typical Applications

- process lines
- environmental chambers
- vacuum-drying processes
- compressed air lines with refrigerant dryers

The Vaisala HUMICAP® Humidity and Temperature Transmitter HMT338 is designed for pressurized processes.

Insert or Remove the Probe while the Process is Running

With “hot tapping”, the probe is inserted directly into the process while it is running, without the need for venting or lowering the process pressure.

The probe is tightened to a ball-valve assembly fixed to the process pipe or wall. The adjustable hex nut is hand-tightened to temporarily hold the probe in place. The probe is then pushed down to the appropriate depth. The hex nut is then tightened with a wrench to lock the probe in place. Hot tapping is possible in pressures up to 10 bar.

Technical Data

Temperature measurement range	-70 ... +180 °C (-94 ... +356 °F)
Operating pressure	0 ... 4MPa (0 ... 40 bar)

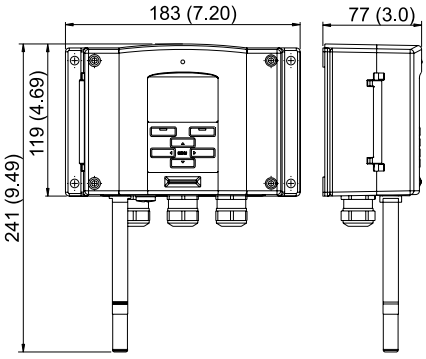
Accessories

Ball-valve set	BALLVALVE-1
Pressure fitting ISO 1/2 to NPT 1/2	210662
USB service port cable with PC software	219916
Connection cable for HM70	211339
Wall-mounting plate (plastic)	214829
Pole installation kit with rain shield	215109
DIN rail installation set	215094
PPS plastic grid filter with stainless steel net	DRW010281SP
PPS plastic grid filter	DRW010276SP
Stainless steel sintered filter	HM47280SP
Stainless steel grid filter	HM47453SP

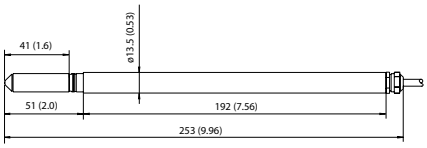
Dimensions of the Probes for the HMT330 Series

Dimensions in mm (inches)

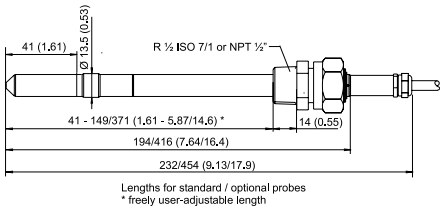
HMT331 probe



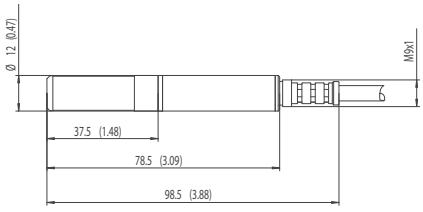
HMT335 probe



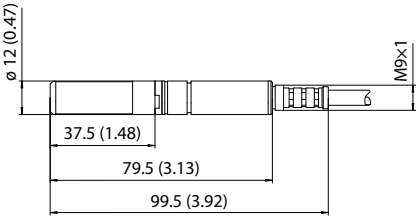
HMT338 probe



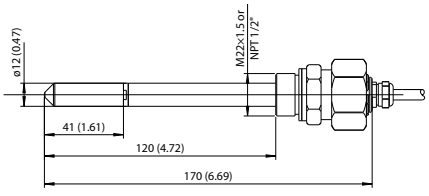
HMT333 probe



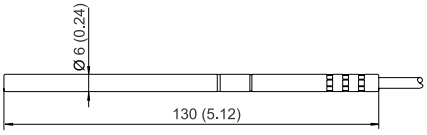
HMT337 RH probe



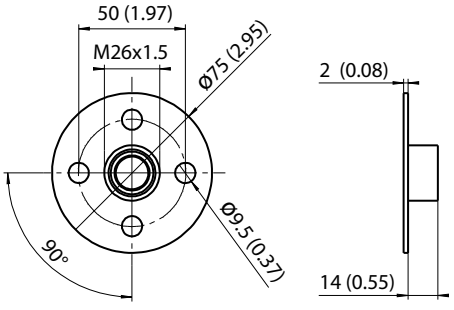
HMT334 probe



HMT337 T probe



Installation flange



Looking for Accurate and Reliable Humidity Instruments? Only Vaisala HUMICAP® Measures Up.

The quality and profitability of your process equals the quality of your measurement.

The success of critical operations depends on small things, such as our humidity sensor. The Vaisala HUMICAP® technology has led the market for almost 40 years through unrivaled reliability continually introducing innovative features for better stability and usability.

Resistant to dust, particulate dirt and most chemicals, Vaisala HUMICAP® delivers the most accurate humidity measurements on the market, even in the harshest conditions.

Choose from a wide range of fixed and handheld instruments for different applications, requirements and budgets.

Improve efficiency, quality, safety and profitability. Vaisala HUMICAP® helps deliver them all.

www.vaisala.com/humidity
sales@vaisala.com

VAISALA

HMT360 Series Intrinsically Safe Humidity and Temperature Transmitters

The Vaisala HUMICAP® Humidity and Temperature Transmitter HMT361 wall mount transmitter, shown with six probe options, is designed specifically for hazardous and explosive environments.

Features/Benefits

- Measures humidity and temperature, outputs also dew point, mixing ratio, absolute humidity and wet bulb temperature
- Safe operation with the entire transmitter in hazardous areas: Division 1 and 2 (USA, Canada), Categories 1G / Zone 0 and 1D / Zone 20 with protection cover (EU)
- Intrinsically safe
- Designed for harsh conditions
- Vaisala HUMICAP® Sensor features high accuracy, excellent long-term stability, and negligible hysteresis
- Six probe options
- Temperature range between -70 ... +180°C (-94 ... +356°F) depending on the probe option
- NIST traceable (certificate included)

The Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMT360 are the ideal solution for measuring humidity in hazardous areas. They operate safely and reliably even in the most hazardous classifications. The HMT360 transmitters' proven performance and technology conform with rigorous international standards.

Intrinsically Safe

The entire HMT360 transmitter can be installed directly in explosive areas. It can withstand continuous exposure to potentially explosive environments that contain flammable gases or dust.

Customized Configuration

Due to the microprocessor based electronics, options and accessories, the HMT360 series is truly flexible.

Customers may specify the transmitter configuration when ordering the instrument, however changes in configuration can also easily be made in the field.

Interchangeable Probes

The HMT360 offers six probe options for various applications:

HMP361	- wall mount
HMP363	- confined spaces
HMP364	- pressurized spaces
HMP365	- high temperature
HMP367	- high humidity
HMP368	- pressurized pipelines

The interchangeable probes enable fast and easy removal or re-installation when required. Calibration, for example, is easy to perform due to the modular structure. All calibration coefficients are included in the probe unit itself, which means that probes can be switched between transmitter bodies without losing the accuracy.

Optimized Sensors

In addition to the standard Vaisala HUMICAP® Sensor, an application specific, very chemically durable sensor is also available.

Long-term Solution

The HMT360 transmitters are an investment; their rugged design, combined with trouble-free operation, ensure a long-term solution for monitoring humidity and dew point in explosive environments.

Customized calibration and maintenance contracts for the HMT360 series are available on request.

Interchangeable Probes for HMT360 Intrinsically Safe Humidity and Temperature Transmitter

The HMP361 probe in this picture has a stainless steel netting filter.

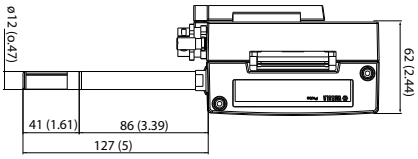
Technical Data

HMP361 for wall mounting

Temperature range	-40 ... +60 °C (-40 ... +140 °F)
Probe diameter	12 mm

Dimensions

Dimensions in mm (inches)



The HMP363 probe is small and fits into tight spaces. This one is connected with a teflon cable.

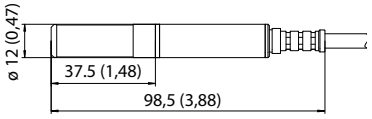
Technical Data

HMP363 for confined spaces

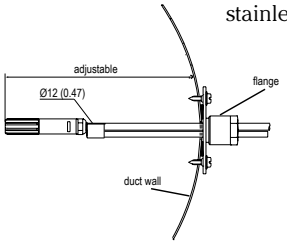
Temperature range with	
teflon cable	-40 ... +120 °C (-40 ... +248 °F)
rubber cable	-40 ... +80 °C (-40 ... +176 °F)
Probe cable length	2, 5 or 10 meters
Probe diameter	12 mm
Installation	
Duct installation kit	210697
Cable Gland M20x1.5 with splitting seal	HMP247CG
Swagelok for 12mm probe, 1/2" NPT thread	SWG12NPT12

Dimensions

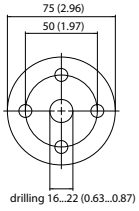
Dimensions in mm (inches)



Installation kit for duct mounting



Installation flange: aluminum or stainless steel



The HMP364 probe is designed for measurement in pressurized spaces or vacuum chambers.

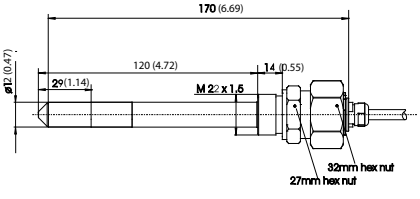
Technical Data

HMP364 for high pressure

Temperature range	-70 … +180 °C (-94 … +356 °F)
Pressure range	0 ... 10 MPa
Probe cable length	2, 5 or 10 meters
Probe diameter	12 mm
Fitting body M22x1.5	17223
Fitting body NPT1/2	17225

Dimensions

Dimensions in mm (inches)



The HMP365 probe is designed for high temperature environments.

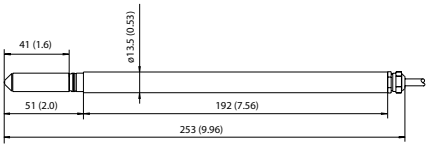
Technical Data

HMP365 for high temperature

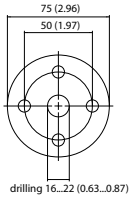
Temperature range	-70 … +180 °C (-94 … +356 °F)
Probe cable length	2, 5 or 10 meters
Probe diameter	13.5 mm
Installation	
Mounting flange	210696
Cable Gland M20x1.5 with splitting seal	HMP247CG

Dimensions

Dimensions in mm (inches)



Installation flange: stainless steel



The HMP367 probe is constructed to be installed in environments with high humidities.

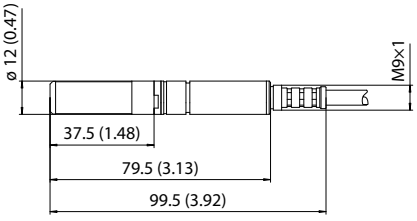
Technical Data

HMP367 for high humidities

Temperature range	-70 … +180 °C (-94 … +356 °F)
Probe cable length	2, 5 or 10 meters
Probe diameter	12 mm
Installation	
Duct installation kit	210697
Cable Gland M20x1.5 with splitting seal	HMP247CG
Swagelok for 12mm probe, 3/8" ISO thread	SWG12ISO38
Swagelok for 12mm probe, 1/2" NPT thread	SWG12NPT12

Dimensions

Dimensions in mm (inches)



The HMP368 probe enables flexible installation in pressurized pipelines.

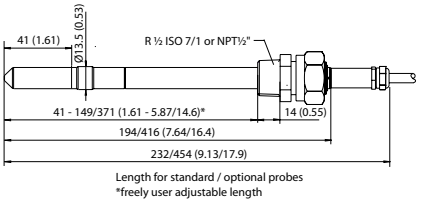
Technical Data

HMP368 for pressurized pipelines

Temperature range	-70 … +180 °C (-94 … +356 °F)
Pressure range	0 ... 4 MPa
Probe cable length	2, 5 or 10 meters
Probe diameter	13.5 mm/12 mm
Two probe lenghts available.	
Installation	
Fitting body ISO1/2 solid structure	DRW212076SP
Fitting body NPT1/2 solid structure	NPTFITBODASP
Ball valve ISO 1/2 with welding joint	BALLVALVE-1

Dimensions

Dimensions in mm (inches)



Technical Data

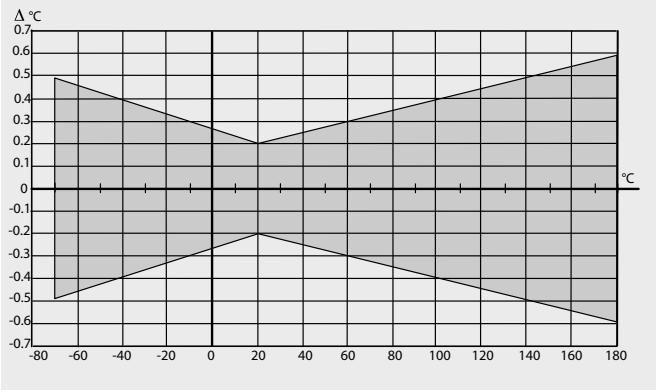
Performance

RELATIVE HUMIDITY

Measurement range	0 ... 100 % RH
Accuracy (including non-linearity, hysteresis, and repeatability)	
with Vaisala HUMICAP® 180R	for typical applications
at +15 ... +25 °C (59 ... +77 °F)	± 1.0 % RH (0 ... 90 %RH) ±1.7 %RH (90 ... 100 %RH)
at -20 ... +40 °C (-4 ... +104 °F)	±(1.0 + 0.008 x reading) %RH
at -40 ... +180 °C (-40 ... +356 °F)	± (1.5 +0.015 x reading) %RH
with Vaisala HUMICAP® 180$_L$2	for application with demanding chemical environment
at -10 ... +40 °C (14 ... +104 °F)	± (1.0 + 0.01 x reading) %RH
at -40 ... +180 °C (-40 ... +356 °F)	± (1.5 + 0.02 x reading) %RH
Factory calibration uncertainty (+20 °C)	± 0.6 % RH (0 ... 40 %RH) ± 1.0 % RH (40 ... 97 %RH)
	(Defined as ±2 standard deviation limits. Small variations possible, see also calibration certificate.)
Response time (90 %) at +20 °C (+68 °F) in still air	
with grid filter	17 s
with grid + steel netting filter	50 s
with sintered filter	60 s

TEMPERATURE

Measurement range	-70 ... +180 °C (-94 ... +356 °F) (depends on selected probe)
Typical accuracy of electronics at +20 °C (+68 °F)	±0.2 °C (0.36 °F)
Typical temparature dependence of electronics	0.005 °C/°C (0.005 °F/°F)
Sensor	Pt1000 RTD Class F0.1 IEC 60751
Accuracy over temperature range	



OTHER VARIABLES

Optionally available	dew point temperature, mixing ratio, absolute humidity, wet bulb temperature.

Operating Environment

Temperature range	
operating temp. range for electronics	-40 ... +60 °C (-40 ... +140 °F)
with display	-20 ... +60 °C (-4 ... +140 °F)
storage	-40 ... +70 °C (-40 ... +158 °F)
Pressure range	see probe specifications

Complies with EMC standard EN61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirements; Industrial Environment.
NOTE! IEC 1000-4-5 complies only when using external EXi approved surge arrester in the safe area.

Inputs and Outputs

Operating voltage	12 ... 28 V
with serial port (service mode)	15 ... 28 V
Analog outputs	two-wire 4 ... 20 mA, one standard, one optional
Typical accuracy of analog outputs at +20 °C	±0.05% full scale
Typical temperature dependence of analog outputs	0.005% / °C (0.005% / °F) full scale
Analog outputs	connection via safety barriers
RS232C serial output for service use	connector type RJ45
Display	two-line LCD

Mechanics

Connections	screw terminals, 0.33...2.0 mm 2 wires (AWG 14-22)
Cable bushings	For 7.5...12mm or 10...15mm cable diameters (M20)
Conduit fitting	NPT 1/2" (M20)
Housing material	G-AlSi10Mg (DIN 1725)
Housing classification	IP66 (NEMA 4X)
Housing weight	950 g

Options and Accessories

Duct installation kit (for HMP363/367)	210697
Mounting flange (for HMP365)	210696
Ball valve ISO 1/2 with welding joint (for HMP368)	BALLVALVE-1
pressure range at +20 °C (+68 °F):	0 ... 20 bar (0 ... 290 psia) (during installation max. 10 bar (145 psia)
Calibration adapter for HMK15	211302
Serial interface cable for PC connectors RJ45 - D9 female	25905ZZ
Galvanic isolator	212483
Zener barrier (USA & Canada)	210664
Protection cover (for use in the presence of combustible dust, ATEX)	214101 II 1 D IP65 T = 70 °C

Classification with Current Outputs

EUROPE / VTT

EU (94/9/EC, ATEX100a)	II 1 G Ex ia IIC T4 Ga
	VTT 09 ATEX 028 X issue No: 2
Safety factors	U_i = 28 V, I_i = 100 mA, P_i = 700 mW
	C_i = 1 nF, L_i negligibly low

Environmental specifications

T_{amb}	-40 ... +60 °C (-40 ... +140 °F)
P_{amb}	0.8 ... 1.1 bar
Dust classification (with protection cover)	II 1 D (IP65 T=70 °C)
	VTT 04 ATEX 023X

USA (FM)	Classes I, II, III, Division 1, Groups A-G and
	Division 2, Groups A-D, F and G
	FM Project ID: 3010615
Safety factors:	Vmax = 28 VDC, I_{max} = 100 mA,
	C_i = 1 nF, L_i = 0, P_i = 0.7 W, T_{amb} = 60 °C(140 °F), T5
JAPAN (TIIS)	Ex ia IIC T4
	Code number: TC20238
Safety factors:	U_i = 28 VDC, I_i = 100 mA, C_i = 1 nF,
	P_i = 0.7 W, L_i = 0, T_{amb} = 60 °C (140 °F)

CANADA (CSA)

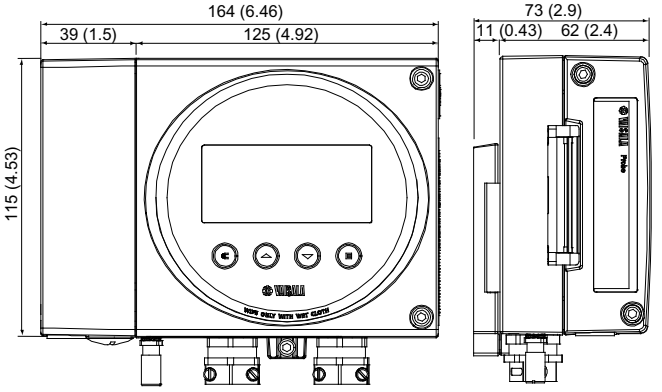
Class I	Division 1 and Division 2, Groups A, B, C, D;
Class II	Division 1 and Division 2, Groups G and
	Coal Dust;
Class III	CSA File No: 213862 0 000, CSA Report: 1300863
Safety factors:	T_{amb} = 60 °C, T4,
	Intrinsically safe when connected as per
	Installation Drawing DRW213478.
CHINA (PCEC)	Ex ia II CT4
	Certificate No. CE092145
	Standard GB3836.1-2000 and GB3836.4-2000
IECEx (VTT)	Ex ia IIC T4 Ga
	IECEx VTT 09.0002x issue No: 2
Safety factors	U_i = 28 V, I_i = 100 mA, P_i = 700 mW
	C_i = 1 nF, L_i negligibly low

Environmental specification

T_{amb}	-40 ... +60 °C (-40 ... +140 °F)
P_{amb}	0.8 ... 1.1 bar

Dimensions

Dimensions in mm (inches)



Accessories

		HMT361	HMT363	HMT364	HMT365	HMT367	HMT368
Accessory	**part number**						
Ball valve ISO 1/2 with welding joint	BALLVALVE-1						√
Cable Gland M20 x 1.5 with splitting seal	HMP247CG		√		√	√	
Duct installation kit	210697		√			√	
Fitting body ISO1/2 solid structure	DRW212076SP						√
Fitting body M22 x 1.5	17223			√			
Fitting body NPT1/2	17225			√			
Fitting body NPT1/2 solid structure	NPTFITBODASP						√
Mounting flange	210696				√		
Swagelok for 12mm probe, 1/2" NPT thread	SWG12NPT12		√			√	
Swagelok for 12mm probe, 3/8" ISO thread	SWG12ISO38		√			√	

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HMT310 Humidity and Temperature Transmitter

The Vaisala HUMICAP® Humidity and Temperature Transmitter HMT310 models (from left to right): HMT313, HMT317, HMT314, HMT318, HMT315 and HMT311.

Features/Benefits

- Next-generation Vaisala HUMICAP® Sensor for excellent accuracy and stability
- Full 0 ... 100 %RH measurement, temperature range up to +180 °C (depending on model)
- Small size, easy to integrate
- Insensitive to dust and most chemicals
- NIST traceable

Reliable Vaisala HUMICAP® Technology

The HMT310 incorporates the latest-generation Vaisala HUMICAP® Sensor. The Vaisala HUMICAP® Sensor is a capacitive thin-film polymer sensor. It features high accuracy, excellent long-term stability and negligible hysteresis. It is insensitive to dust, particulate dirt and most chemicals.

Several Outputs, One Connector

The HMT310 is powered up with 12 ... 35 VDC. It has two analog outputs and an RS-232 serial output. The output signal and the supply power travel in the same cable, the only cable connected to the unit.

Chemical Purge

Chemical purge helps to maintain measurement accuracy between calibraton intervals and it involves heating the sensor to remove harmful chemicals. The function can be initiated manually or programmed to occur at set intervals.

Optional Functions

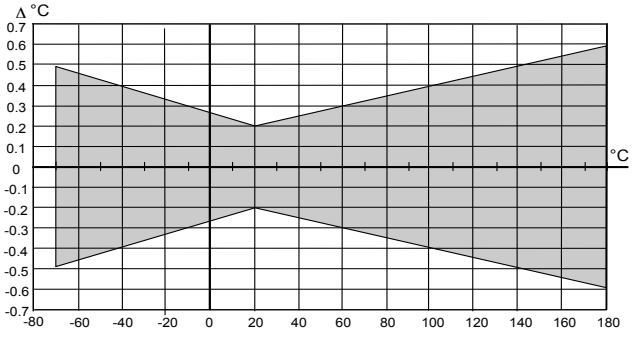
The following optional functions are available: several probes for various applications, calculated humidity quantities, different mounting kits, sensor protection options and probe cable lengths, warmed probe and sensor heating for high humidity conditions (HMT317), and chemical purge for applications risking an interference with chemicals in the measuring environment.

Technical Data

Measured Values

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Sensor	
Vaisala HUMICAP®180R	typical applications
Vaisala HUMICAP®180RC	applications with chemical purge and/or warmed probe
Accuracy (incl. non-linearity, hysteresis and repeatability) at a temperature range of	
+15 ... +25 °C	±1 %RH (0 ... 90 %RH) ±1.7 %RH (90 ... 100 %RH)
-20 ... +40 °C	±(1.0 + 0.008 x reading) %RH
-40 ... +180 °C	±(1.5 + 0.015 x reading) %RH
Factory calibration uncertainty (+20 °C)	±0.6 %RH (0 ... 40 %RH)* ±1.0 %RH (40 ... 97 %RH)*
** Defined as ±2 standard deviation limits. Small variations possible, see also calibration certificate.*	
Response time (90 %) at +20 °C in 0.1 m/s air flow	17 s with grid filter 50 s with grid and steel, netting filter 60 s with sintered filter
TEMPERATURE	
HMT311	-40 ... +60 °C (-40 ... +140 °F)
HMT313	-40 ... +80 °C (-40 ... +176 °F) or -40 ... +120 °C (-40 ... +248 °F)
HMT314, HMT315, HMT317, HMT318	-70 ... +180 °C (-94 ... +356 °F)

Accuracy over temperature range (see graph below)



Typical temperature dependence of electronics	±0.05 °C/°C (±0.005 °F/°F)
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751

Electrical Connections

Two analog outputs, selectable and scalable	0 ... 20 mA or 4 ... 20 mA
Typical accuracy of analog output at +20 °C	±0.05 % full scale
Typical temperature dependence of analog output	0.005 %/°C (0.003 %/°F) of full scale
Serial output	RS–232C
Connections	M12 8-pole connector with RS-232C, current outputs (two channels) and U_{in}
Operating voltage	12 ... 35 VDC, the maximum operating voltage for a device with sensor heating is 24 VDC
Power consumption	30 mA with RS-232
External load	R_l < 500 Ohm
Startup time after power-up	3 s

General

Operating temperature range for electronics	-40 ... +60 °C (-40 ... +140 °F)
Storage temperature range	-55 .... +80 °C (-67 ... +176 °C)
Operating pressure	
HMT314	0 ... 100 bar
HMT318	0 ... 40 bar
HMT315, HMT317	vapor tight
Transmitter housing material	G-AlSi10Mg
Transmitter base material	ABS/PC
Housing classification	IP65
Cable feed through alternatives	8-pole connector with 5 m cable, Female 8-pin connector screw joint for cable diameter 4 ... 8 mm
Sensor protection	PPS grid with stainless steel net, PPS grid, Sintered filter Membrane stainless steel filter
Complies with EMC standard EN61326-1, Industrial environment	

Note: When using the current output, the RF field susceptibility level according to standard EN61000-4-3 with a frequency band of 110 ... 165 MHz, is only 3V/m (generic environment) with the specified accuracy.

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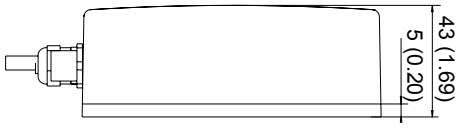
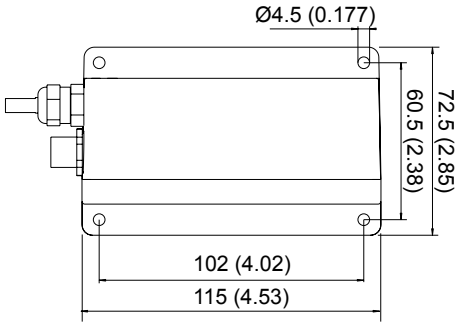
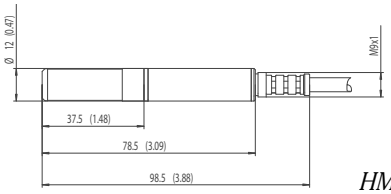
Dimensional Drawings of the HMT310 Humidity and Temperature Transmitter

Transmitter body dimensions in mm (inches)

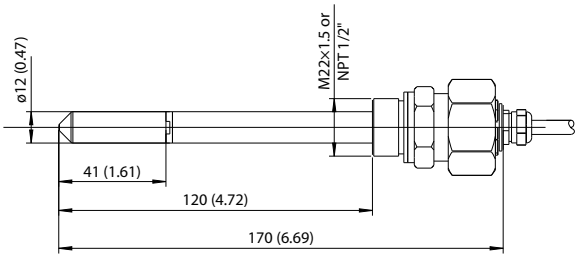




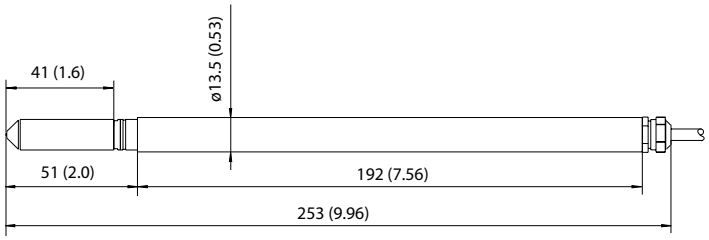
Probe dimensions in mm (inches)



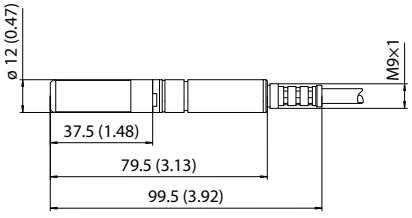
HMT313 probe



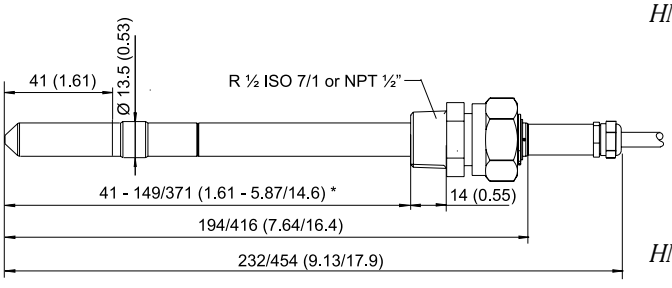
HMT314 probe



HMT315 probe



HMT317 probe



HMT318 probe

Lengths for standard / optional probes
* freely user-adjustable length

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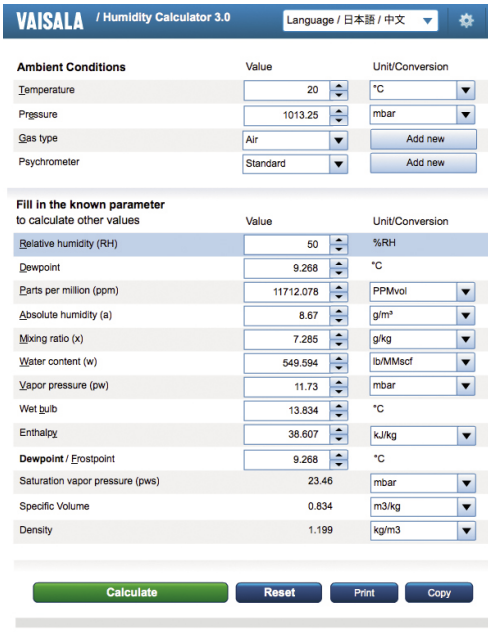
Calculate and Convert.

The free web based Vaisala Humidity Calculator allows you to calculate several humidity parameters from one known humidity value. Make unit conversions on the fly, and see the effects of changing ambient conditions, like temperature and pressure. The calculator is available in several languages.

Access or download
the Vaisala Humidity Calculator at
www.vaisala.com/humiditycalculator



Available also as:

iPhone app

Android app

www.vaisala.com/humiditycalculator

VAISALA

Vaisala HUMICAP® Humidity and Temperature Transmitters HMT120 and HMT130

The HMT120/130 with and without a display.

The Vaisala HUMICAP® Humidity and Temperature Transmitters HMT120 and HMT130 are designed for humidity and temperature monitoring in cleanrooms and are also suitable for demanding HVAC and light industrial applications.

Performance

The HMT120/130 incorporates Vaisala HUMICAP® technology that measures relative humidity accurately and reliably. The Vaisala HUMICAP® is resistant to dust and most chemicals.

The transmitter enclosure is optimized for use in cleanrooms. The smooth surface of the enclosure makes it easy to clean and the enclosure material is chosen to tolerate purifying agents. Furthermore, the cabling can be done through the back wall of the transmitter.

Interchangeable Probe

The HMT120/130 transmitters use a fully interchangeable relative humidity probe. The probe can be easily removed and replaced with a new one without having to adjust the transmitter, which allows for easy and quick recalibration of the transmitter. The probe can be adjusted using one of Vaisala's portable meters as a reference.

Also available is a constant output probe with fixed RH and T output for convenient inspection of the monitoring system and signal transfer line.

Available Options

The HMT120 and HMT130 transmitters are available as wall mounted or with remote probe. For high temperature applications or where space is limited, the remote probe is ideal. The transmitters come with an optional LCD display, which shows the measurement results of selected parameters in selected units. The parameters are displayed simultaneously at two separate rows on the display.

Features/Benefits

- Vaisala HUMICAP® technology with humidity sensor HUMICAP® 180R
- Humidity parameter options: relative humidity, dew point/frost point, wet bulb temperature, enthalpy, absolute humidity, mixing ratio, vapor pressure, and saturation vapor pressure
- 2-wire loop-powered or 3-wire voltage output configurations
- Interchangeable probe (easy field calibration)
- Accurate and reliable
- Resistant to dust and most chemicals
- Optional LCD display
- USB cable available for a PC connection for maintenance
- Wall-mounted or with a remote probe
- Constant output probe available
- Can be mounted outdoors using a Vaisala installation kit and the Vaisala Radiation Shield DTR504A
- Enclosure IP65
- 3-point NIST traceable calibration (certificate included)
- Suitable for cleanrooms and demanding HVAC and light industrial applications

Technical Data

Performance

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy including non-linearity, hysteresis, and repeatability	
temperature range	0 °C ... +40 °C
0 ... 90 %RH	±1.5 %RH
90 ... 100 %RH	±2.5 %RH
temperature range	-40 ... 0 °C, +40 ... +80 °C
0 ... 90 %RH	±3.0 %RH
90 ... 100 %RH	±4.0 %RH
Factory calibration uncertainty at +20 °C (+68 °F)	
0 ... 90 %RH	±1.1 %RH
90 ... 100 %RH	±1.8 %RH
Humidity sensor	Vaisala HUMICAP® 180R
Stability	±2 %RH over 2 years
In typical HVAC applications	±0.5 %RH per year
TEMPERATURE	
Measurement range	-40 °C ... +80 °C
Accuracy over temperature range	
at +15 °C ... +25 °C	±0.2 °C
at 0 ... +15 °C and at +25 °C ... +40 °C	±0.25 °C
at -40 °C ... +0 °C and at +40 °C ... +80 °C	±0.4 °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
OTHER VARIABLES (OPTIONAL)	
dew point/frost point, wet bulb temperature, enthalpy, absolute humidity, mixing ratio, vapor pressure, and saturation vapor pressure	

Operating Environment

Operating temperature range	
transmitter body, no display	-40 °C ... +60 °C
transmitter body, with display	-20 °C ... +60 °C
HMP110 probe	-40 °C ... +80 °C
Storage temperature range	-50 °C ... +70 °C
Electromagnetic compatibility	EN 61326-1 and EN 55022

Mechanics

Material	
transmitter housing	PBT plastic
display window	PC plastic
probe body	Stainless steel (AISI 316)
probe grid filter	Chrome coated ABS plastic
Housing classification	IP65
Connections	
inputs and outputs	Screw terminals 0.5 ... 1.5 mm^2
probe interface	4-pin M8 female panel connector
Probe cable lengths	3 m, 5 m, 10 m - up to 50 m
Display (optional)	128 x 64 resolution full graphics B&W display without backlight
Weight (including probe)	270 g

Inputs and Outputs

HMT120 TWO-WIRE TRANSMITTER (LOOP POWERED)	
Current output signals	4 ... 20 mA
External loop voltage	10 ... 30 VDC (R_L= 0 ohms) 20 ... 30 VDC (R_L< 500 ohms)
HMT130 THREE-WIRE TRANSMITTER	
Voltage output signals	0 ... 1 V, 0 ... 5 V, 0 ... 10 V or user defined between 0 ... 10 V
Min output resistance	1 kohm
Serial output	RS485, non-isolated
Relay output	1 relay (max. 50 VDC, 200 mA)
Supply voltage	10 ... 35 VDC 15 ... 35 VDC (when output 0 ... 10 V) 24 VAC (±20 %)
Current consumption at 24 VDC	8 mA, if relay closed 15 mA
Max. additional error caused by the analog outputs after calibration at +20 °C ambient temperature	±0.1 % of FS output signal
Temperature dependence of the analog outputs	±0.005 % of FS output signal

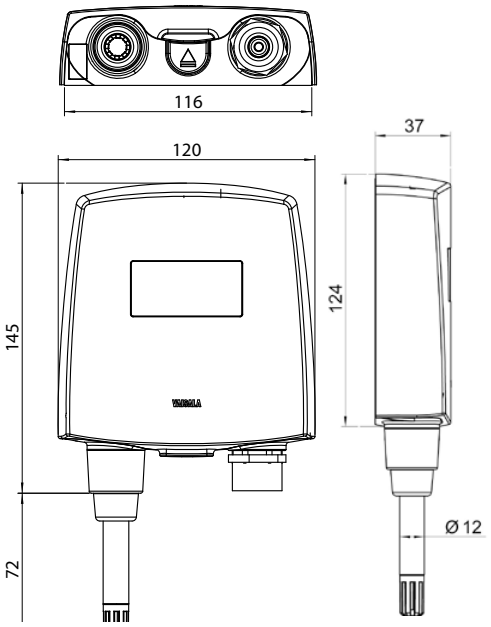
Accessories

Humidity and temperature probe	HMP110*
Humidity and temperature replacement probe	HMP110R*
Constant output probe	HMP110REF*
Humidity sensor	HUMICAP® 180R
Probe mounting flange	226061
Probe mounting clamps, 10 pcs	226067
HMP110 sensor protection	
plastic grid filter	DRW010522SP
plastic grid with membrane filter	DRW010525SP
stainless steel sintered filter	HM46670SP
Probe cable 3 m	HMT120Z300
Probe cable 5 m	HMT120Z500
Probe cable 10 m	HMT120Z1000
Radiation shield	DTR504A
Rain shield with installation kit	215109
Duct installation kit	215619
HMI41 connection cable	25917ZZ
HM70 connection cable	211339
USB serial interface cable	219685

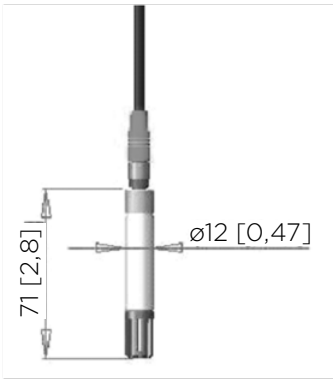
**See separate order form*

Dimensions

Dimension in mm



Remote probe dimensions



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The four-step Vaisala Humidity Expert Series will give you all you need to know to become an expert in humidity.

- Convert different humidity parameters
- Make easy calculations with Vaisala Humidity Calculator
- Learn the optimal calibration methods for humidity calibration
- Get familiar with the operational principle of your humidity sensor

Getting access to all this expertise is easy – sign up now at **www.vaisala.com/humidityexpert**

HMW90 Series Humidity and Temperature Transmitters for High Performance HVAC Applications

The HMW90 Series Humidity and Temperature Transmitters are designed for demanding HVAC applications.

Features/Benefits

- Both analog and digital output
- Easy installation, configuration, and field adjustment
- Humidity parameter options: relative humidity, dew point, mixing ratio, enthalpy, wet bulb temperature, dew point depression, and absolute humidity
- Full 0 ... 100%RH measurement range
- Up to ±1.7%RH accuracy
- User exchangeable humidity and temperature module
- NIST traceable calibration (certificate included)
- Available in four colors

BACnet in Brief

- A data communication protocol for Building Automation and Control networks
- Used in management, automation and field level communication
- ANSI/ISO/ASHRAE standard controlled by a standardization body
- Adds flexibility by allowing the integration of products and systems from different manufacturers

Wall-mounted Vaisala HMW90 Series HUMICAP® Humidity and Temperature Transmitters measure relative humidity and temperature in indoor HVAC applications, where high accuracy, stability, and reliable operation are required.

The flexible HMW90 series offers a variety of options and features. Transmitters include a display and a sliding cover with either an opening for the display or a solid front. Both analog and digital output options, including special scalings and calculated parameters, are available.

Quick and Easy to Install

HMW90 series transmitters are quick and easy to install. The wiring is connected through the back plate and the electronics with the sensors can be snapped on easily after the wiring is complete. The transmitter is configured using dip switches, which are accessible when the enclosure is open.

Digital Communication Brings Benefits

The introduction of digital (BACnet/Modbus) communication to field level devices brings many advantages. For example, all sensors can be centrally accessed and their performance can be easily monitored. Wiring is simple when multiple sensors are installed on the same bus. Sensors can be set up using standardized tools, and the system can be enlarged with additional sensors quickly and conveniently. In addition, parameters influencing measurements, such as pressure or site elevation, can be centrally set and updated.

Choose from a Wide Variety of Calibration Options

On-site calibration and adjustment is exceptionally easy. The sliding cover exposes offset trimmers for one-point calibration without disturbing measurement. The display instantly indicates the effects of changes, making it clear and convenient to make adjustments. A service port enables two-point calibration, using either a PC or the Vaisala HUMICAP® Hand-Held Humidity and Temperature Meter HM70. HMW90 series transmitters include a user-exchangeable measurement module, which can be ordered as a spare part. Calibration services are available through all Vaisala Service Centers.

Technical Data

Models

TMW92	T-only	2-wire, current output
TMW93	T-only	3-wire, voltage output
TMW90	T-only	configurable analog output model
HMW92	RH+T	2-wire, current output
HMW92D	RH+T	2-wire, current output with display
HMW93	RH+T	3-wire, voltage output
HMW93D	RH+T	3-wire, voltage output with display
HMW90	RH+T	Configurable analog/digital model
HMW95	RH+T	Digital (BACnet, Modbus) model
HMW95D	RH+T	Digital (BACnet, Modbus) model with display

Performance

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH, non-condensing
Accuracy	
Temperature range	+10 ... +40 °C (+50 ... +104 °F)
0 ... 90 %RH	±1.7 %RH
90 ... 100 %RH	±2.5 %RH
Temperature range	-5 ... +10 °C, +40 ... + 55 °C (+23 ... +50 °F, +104 ... +131°F)
0 ... 90 %RH	±3 %RH
90 ... 100 %RH	±4 %RH
Stability in typical HVAC applications	±0.5 %RH/year
Humidity sensor	Vaisala HUMICAP® 180R
TEMPERATURE	
Measurement range	-5 ... +55 °C (+23 ... +131 °F)
Accuracy	
+20 ... +30 °C (+68 ... +86 °F)	±0.2 °C (± 0.36 °F)
+10 ... +20 °C, +30 ... +40°C (+50 ... +68 °F, +86 ... +104 °F)	±0.3 °C (± 0.54 °F)
-5 ... +10 °C, +40...+55°C (+23 ... +50 °F, +104 ... +131 °F)	±0.5 °C (± 0.90 °F)
Temperature sensor	Digital temperature sensor

Operating Environment

Operating temperature range	-5 ... +55 °C (+23 ... +131 °F)
Storage temperature range	-30 ... +60 °C (-22 ... +140 °F)
Electromagnetic compliance	EN61326-1, Industrial Environment

Spare Parts and Accessories

Humidity and Temperature Module	HTM10SP
Temperature Module (for T-only models)	TM10SP
Decorative cover set (10 pcs.)	236285
Connection cable for HM70 hand-held meter	219980
USB cable for PC connection	219690

Mechanics

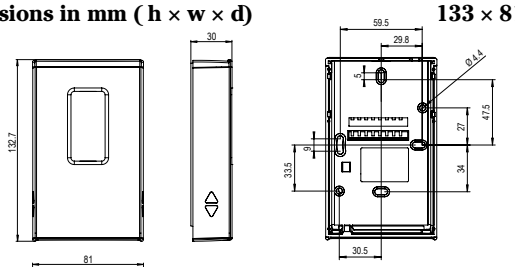
IP class	IP30
Standard housing color	White (RAL9003*)
Optional housing colors	Black (RAL9005*)
(configurable models only)	Grey (RAL7035*)
	Light Ivory (RAL1015*)
Housing material	ABS/PC, UL-V0 approved
Output connector	Screw terminals
	max. wire size 2 mm² (AWG14)
Service port connector	4-pin M8
Weight	155 g

**RAL code is only indicative with potential small variations in color shade*

Inputs and Outputs

Current output models	
Outputs	2 x 4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28 VDC at 500 Ω load
	10 ... 28 VDC at 0 Ω load
Isolation between output channels	500 VDC
Voltage output models	
Outputs	2 × 0...5 V or 2 × 0...10 V
Load resistance	10 kΩ min.
Supply voltage	18 ... 35 VDC, 24 VAC ±20 % 50/60 Hz
Max. current consumption	12 mA
	max. with relay 25 mA
Relay	1 pc (max. 50 VDC, 500 mA)
Digital models	
Supply voltage	18 … 35 VDC, 24 VAC ± 20% 50/60 Hz
Max. current consumption (with 120 Ω termination)	30 mA at 24 VDC
Output type	RS-485 (galvanic isolation, 1.5 kV)
RS-485 end of line termination	Enable with jumper, 120 Ω
Supported protocols	Selectable by DIP switch
BACnet MS/TP	
Operating mode	Selectable Master/Slave
Address range, master mode	0 … 127
Address range, slave mode	128…255
Modbus RTU	
Address range	0 … 247
Service port	RS-485 line for temporary service use

Dimensions in mm (h × w × d) **133 × 81 × 30**



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HMD60/70 Humidity and Temperature Transmitters for Ducts in HVAC Applications

Vaisala HUMICAP® Humidity and Temperature Transmitters HMD60 and HMD70 are designed for use in air conditioning applications where accurate and stable control of relative humidity and temperature are required.

Features/Benefits

- Full 0 ... 100 %RH measurement
- Accuracy up to ±2 %RH
- True two-wire transmitters with 4 ... 20 mA loop powered output (HMD60)
- Selectable signal output of 0 ... 1 V, 0 ... 5 V or 0 ... 10 V (HMD70) with optional current module also 0 ... 20 mA (HMD70)
- Vaisala HUMICAP® Sensor for excellent accuracy and long-term stability, negligible hysteresis and resistance to dust and most chemicals.
- Temperature compensated
- IP65 (NEMA 4) housing
- Also available as temperature-only transmitters HMD 60T/70T
- NIST traceable (certificate included)

The duct mounted Vaisala HUMICAP® Humidity and Temperature Transmitters HMD60 and HMD70 are designed for monitoring relative humidity and temperature in building energy management systems. The combination of high accuracy, stability and reliable operation, make these products the ideal choice for demanding applications.

Resistant to Chemicals and Dust

The duct mount HMD60 and HMD70 transmitters can also be used in many industrial humidity monitoring applications, where their stability and resistance to chemicals and dust are of great value. A useful feature of these duct mount transmitters is the ability to remove the electronics without removing the unit from the duct.

Measures both Humidity and Temperature

The HMD60 and HMD70 transmitters are available in three models: U for humidity measurement-only, Y for humidity and temperature measurement, and T for temperature only.

Fast, On-Site Calibration

The accuracy of the transmitters is simple to check using either the Vaisala HUMICAP® Hand-Held Humidity and Temperature Meter HM70 or the Vaisala HUMICAP® Humidity Indicator HMI41. The calibration can be done in seconds with a single potentiometer without disturbing the operation, resulting in great savings both in maintenance time and costs.

Technical Data

60 Series: 2-wire, 4 to 20 mA Output

Duct mount	RH only	HMD60U
	RH & T	HMD60Y
	T only	HMD60T

70 Series: 3-wire, Variable Voltage Output

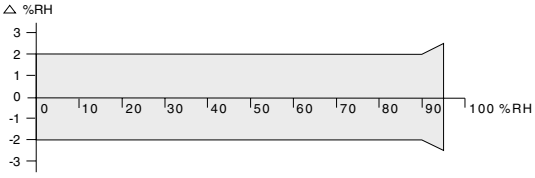
Duct mount	RH only	HMD70U
	RH & T	HMD70Y
	T only	HMD70T

Relative Humidity

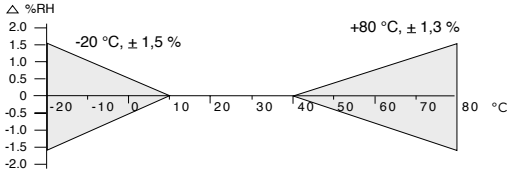
Measurement range

duct mount 0 ... 100 %RH*

Accuracy at +20 °C



Temperature dependence



Response time at +20 °C (+68 °F),

90% response 15 s (with membrane filter)

Stability ± 2 %RH / 2 years

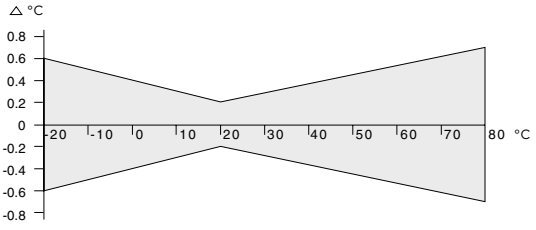
Temperature (Y and T Models)

Linearity better than 0.1 °C

Sensor Pt 1000 RTD Class F0.3 IEC 60751

Measurement range -20 ... +80 °C (-4 ... 176 °F) **

Accuracy



** Optional temperature scales are available on request.

General - 60 Series

Supply voltage	10 ... 35 VDC (RL = 0 ohm)
	20 ... 35 VDC (RL = 500 ohm)
Output signal	4 ... 20 mA

General - 70 Series

Supply voltage range depends on the selected output signal

	DC	AC
0 ... 1 V	10 ... 35 V	9 ... 24 V
0 ... 5 V	14 ... 35 V	12 ... 24 V
0 ... 10 V	19 ... 35 V	16 ... 24 V
WITH OPTIONAL CURRENT MODULE		
0 ... 20 mA (RL = 0 ohm)	10 ... 35 V	11 ... 24 V
**0 ... 20 mA (RL = 500 ohm)	20 ... 35 V	17 ... 24 V

Power consumption @ 24 VAC

HMD70U 10 mA typical

HMD70Y 12 mA typical

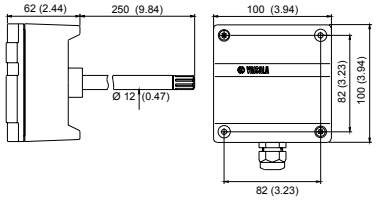
General

Operating temperature range	
electronics	-5 ... +55 °C (+23 ... +131 °F)
probe	-20 ... +80 °C (-4 ... +176 °F)
Storage temperature range	-40 ... +80 °C (-40 ... +176 °F)
Maximum flow speed	50 m/s
Current module	part no. 18945 HM
Housing	
probe	stainless steel
electronics	cast aluminum
Connections	screw terminals 0.5 ... 1.5 mm^2
Sensor protection	
standard	membrane filter (part no. DRW010525)
optional	stainless steel sintered filter (part no. HM46670SP)
Cable thread-through	
bushing for 7 ... 10 mm (PG9)	
cable housing IP65 (NEMA 4)	part no. 18941HM
armoured cable glands	part no. 10528HM
(must be ordered separately)	

Complies with EMC standard EN61326 and EN55022

Dimensions

Dimensions in mm (inches)



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HMDW110 Series Humidity and Temperature Transmitters for High-Accuracy Measurements in HVAC Applications

HMDW110 Series Humidity and Temperature Transmitters for measurements in ducts, outdoor environments, and humid areas.

Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMDW110 measure relative humidity and temperature in multiple HVAC applications. The series includes transmitters for duct mounting, IP65-classified wall transmitters, and outdoor transmitters with integrated radiation shields.

Proven Vaisala HUMICAP® Performance

The cost-efficient HMDW110 series transmitters are equipped with trusted HUMICAP® 180R sensors. The sensor's superior long-term stability minimizes maintenance needs throughout the transmitter's lifetime. If necessary, the transmitter can be field-calibrated using either an HM70 Hand-Held Humidity and Temperature Meter, or a PC connection.

HMDW110 series instruments are individually adjusted and delivered with a calibration certificate. The factory calibration is traceable to NIST.

Unrivaled Outdoor Humidity Measurements

The integrated radiation shield of the outdoor models HMS110 and HMS112 enables unrivaled measurement performance. It reduces the impact of sunshine on temperature and humidity measurements, and ensures measurement accuracy in outdoor conditions. The most popular control parameters in free cooling – dew point temperature, wet bulb temperature, and enthalpy – are available as output parameters.

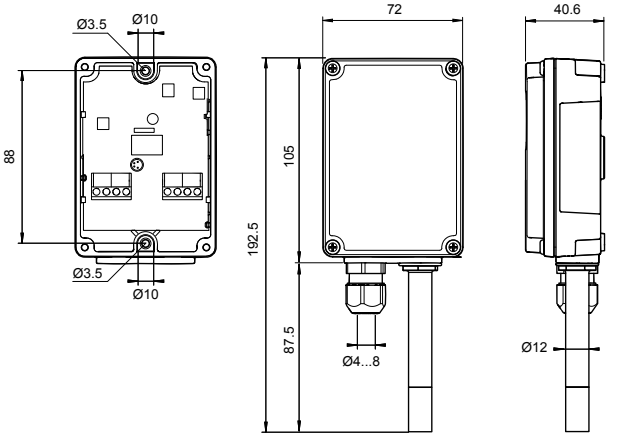
Features/Benefits

- Accurate humidity and temperature transmitters for measurements in HVAC and cleanroom applications
- Outdoor transmitter with professional-grade radiation shield
- Proven HUMICAP® 180R sensor for superior long-term stability
- ±2 %RH accuracy
- 3-point NIST traceable calibration (certificate included)
- On-site calibration with HM70 Hand-Held Meter or PC connection
- Current output (4 ... 20 mA)
- Default output parameters are relative humidity and temperature. Dew point temperature, wet bulb temperature, and enthalpy outputs selectable with a PC connection.

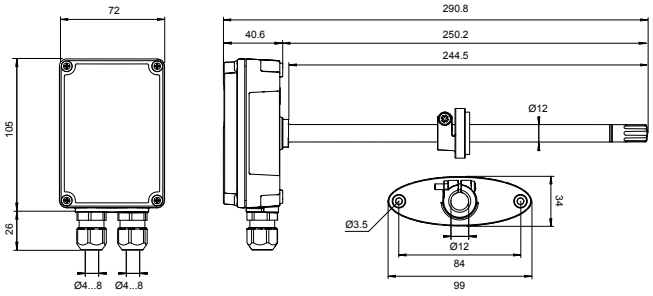
Well-Suited for Cleanroom Monitoring

The HMD110 and HMW110 transmitters can be ordered with a catalytic HUMICAP® sensor HUMICAP® 180VHP. The catalytic sensor improves stability especially in hydrogen peroxide sterilized environments where repeated condensation is expected.

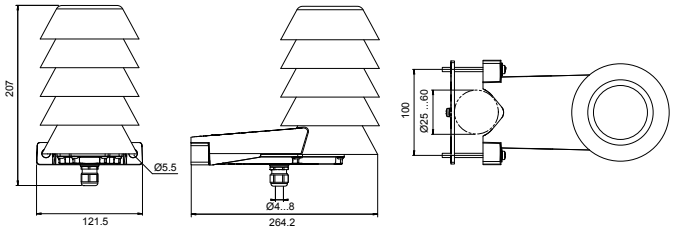
An optional panel display can be added for remote monitoring. Transmitters can be installed into difficult-to-reach locations, while measurement data can be read from a more convenient spot.



HMW110/112
RH+T transmitters for measurements in wet areas



HMD110/112
RH+T transmitters for ducts



HMS110/112
RH+T transmitters for outdoor measurements

Technical Data

Models

Model number	Type	Output	Special Features	Ingress Protection
HMW110	Wall-mount, RH+T	2-wire, current output	Configurable model*	IP65
HMW112	Wall-mount, RH+T	2-wire, current output		IP65
HMD110	Duct-mount, RH+T	2-wire, current output	Configurable model*	IP65
HMD112	Duct-mount, RH+T	2-wire, current output		IP65
HMS110	Outdoor, RH+T	2-wire, current output	Radiation shield, configurable model*	IP65
HMS112	Outdoor, RH+T	2-wire, current output	Radiation shield	IP65

*Delivered with customer specific output settings, including calculated humidity parameters and special scaling of outputs.

Performance

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy	
Temperature range	+10 ... +30 °C (+50 ... +86 °F)
0 ... 90 %RH	±2 %RH
90 ... 100 %RH	±3 %RH
Temperature range	-20 ... +10 °C, +30 ... +60 °C (-4 ... +50 °F, +86 ... +140 °F)
0 … 90 %RH	±3 %RH
90 … 100 %RH	±4 %RH
Temperature range	-40 ... -20 °C (-40 ... -4 °F)
0 ... 100%RH	±4 %RH
Stability in typical HVAC applications	±0.5 %RH/year
Humidity sensor	Vaisala HUMICAP® 180R
TEMPERATURE	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy	
At +20 °C (+68 °F)	±0.3 °C
Temperature dependence	±0.01 °C/10 °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
CALCULATED PARAMETERS	
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40 ... 460 kJ/kg (-10 ... +190 BTU/lb)
Accuracy of the calculated parameters should be calculated at the actual condition based on the RH and temperature specification.	
Accuracy at 20°C (68°F) and 80%RH:	
Dew point	±0.7 °C (1.2 °F)
Wet bulb temperature	±0.5 °C (0.9 °F)
Enthalpy	±1.6kJ/kg (0.7 BTU/lb)

Operating Environment (All Models)

Operating temperature range	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity range	0 ... 100 %RH
Maximum wind/flow speed	30 m/s
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Electromagnetic compliance	EN61326-1, Industrial Environment

Mechanics

Max wire size	1.5 mm^2 (AWG 16)
Standard housing color	White (RAL9003)
Housing material	PC + 10%GF (UL-V0 approved)

Inputs and Outputs

Analog output	4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28VDC at 600 Ω load
	10 ... 28VDC at 0 Ω load
Data input for RDP100 Remote Panel Display	RS485, Vaisala proprietary protocol

Spare Parts and Accessories

Remote Panel Display	RDP100
Conduit fitting + O-ring (M16x1.5 / NPT1/2 Inch)	210675SP
Conduit fitting + O-ring (M16x1.5 / PG9, RE-MS)	210674SP
Fastening set HMS110	237805
Porous PTFE Filter	DRW239993SP
Membrane Filter	ASM210856SP
Terminal Block, Blue	236620SP
USB cable for PC connection	219690
Connection cable for HM70 hand-held meter	219980SP
HUMICAP® 180R sensor	HUMICAP180R
Catalytic HUMICAP® sensor	HUMICAP180VHP

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Vaisala HVAC Instruments

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90 series for high performance HVAC

STABLE AND RELIABLE HUMIDITY SENSOR

QUICK AND ACCURATE DELIVERIES

80 series for standard HVAC

Online Store

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VAISALA

HMS110 Series Humidity and Temperature Transmitters for High-Accuracy Outdoor Measurements in Building Automation Applications

HMS110 Series Humidity and Temperature Transmitters with HUMICAP® sensor.

Features/Benefits

- Reliable outdoor transmitters with integrated radiation shields
- ±2 %RH accuracy
- Proven HUMICAP® 180R sensor for long-lasting accuracy
- 3-point NIST traceable calibration (certificate included)
- Default output parameters are relative humidity and temperature. Dew point temperature, wet bulb temperature, and enthalpy outputs selectable with a PC connection.
- Current output (4...20 mA)
- On-site calibration with HM70 Hand-Held Meter or PC connection
- Ingress protection IP65

Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMS110 are designed for demanding outdoor measurements in building automation applications. These ±2% transmitters include an integrated radiation shield to reduce the influence of solar radiation on temperature and humidity measurements.

Proven Vaisala HUMICAP® Performance for Outdoor Measurements

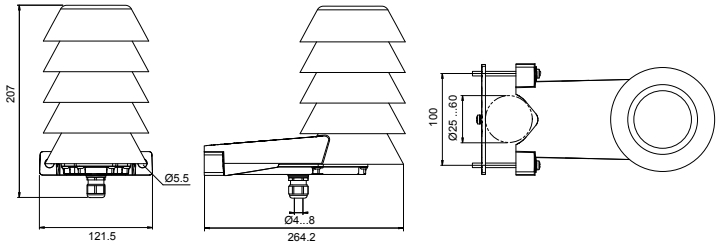
HMS110 transmitters are equipped with the trusted HUMICAP® 180R – a robust, general-purpose humidity sensor that functions well in high humidity. The sensor's superior stability ensures long-lasting accuracy and minimal maintenance throughout the transmitter's lifetime.

The integrated radiation shield allows unrivaled measurement performance, reducing the impact of sunshine on temperature and humidity measurements and ensuring measurement accuracy in outdoor conditions.

Easy Installation and Maintenance

HMS110 transmitters are easy to install. They can be mounted directly onto a wall or pole without any extra accessories. There are no loose parts, screws are retained in the enclosure, all connectors are clearly labeled, and the connectors are within easy reach.

The HUMICAP® sensor's excellent long-term stability and high-quality materials ensure minimal need for maintenance. If necessary, the transmitter can be field-calibrated using either an HM70 Hand-Held Humidity and Temperature Meter, or a PC connection.



Technical Data

Models

MODEL NUMBER	TYPE	OUTPUT	SPECIAL FEATURES	INGRESS PROTECTION
HMS110	Outdoor, RH+T	2-wire, current output	Delivered with customer specific output settings, including calculated humidity parameters and special scaling of outputs.	IP65
HMS112	Outdoor, RH+T	2-wire, current output		IP65

Performance

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy	
Temperature range	+10 ... +30 °C (+50 ... +86 °F)
0 ... 90 %RH	±2 %RH
90 … 100 %RH	±3 %RH
Temperature range	-20 ... +10° C, +30 ... +60 °C (-4 ... +50 °F, +86 ... +140 °F)
0 … 90 %RH	±3 %RH
90 … 100 %RH	±4 %RH
Temperature range	-40 ... -20 °C (-40 ... -4 °F)
0 ... 100%RH	±4 %RH
Stability in typical HVAC applications	±0.5 %RH/year
Humidity sensor	Vaisala HUMICAP® 180R
TEMPERATURE	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy	
At +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Temperature dependence	±0.01 °C/ °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
CALCULATED PARAMETERS	
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40 ... 460 kJ/kg (-10 ... +190 BTU/lb)
Accuracy of the calculated parameters should be calculated at the actual condition based on the RH and temperature specification. Accuracy at 20°C (68°F) and 80%RH:	
Dew point	±0.7°C (1.2°F)
Wet bulb temperature	±0.5°C (0.9°F)
Enthalpy	±1.6kJ/kg (0.7 BTU/lb

Operating Environment

Operating temperature range	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity range	0 ... 100 %RH
Maximum wind/flow speed	30 m/s
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Electromagnetic compliance	EN61326-1, Industrial Environment

Mechanics

Max wire size	1.5 mm² (AWG 16)
Standard housing color	White (RAL9003)
Housing material	PC + 10%GF (UL-V0 approved)

Inputs and Outputs

Analog output	4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28VDC at 600 Ω load 10 ... 28VDC at 0 Ω load
Data input for RDP100 Remote Panel Display	RS485, Vaisala proprietary protocol

Spare Parts and Accessories

Remote Panel Display	RDP100
Conduit fitting + O-ring (M16x1.5 / NPT1/2 Inch)	210675SP
Conduit fitting + O-ring (M16x1.5 / PG9, RE-MS)	210674SP
Fastening set HMS110	237805
Membrane Filter	ASM210856SP
Terminal Block, Blue	236620SP
USB cable for PC connection	219690
Connection cable for HM70 hand-held meter	219980SP
HUMICAP® 180R sensor	HUMICAP180R

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HMDW80 Series Humidity and Temperature Transmitters for Building Automation Applications

HMDW80 Series Humidity and Temperature Transmitters for multiple applications within building automation.

Features/Benefits

- Reliable transmitters for basic HVAC humidity measurements
- ±3.0 %RH accuracy
- Full 0 ... 100 %RH measurement range
- Optimized for easy installation and low maintenance
- User exchangeable INTERCAP® sensor for easy field replacement
- Output parameters: relative humidity and temperature with optional dew point temperature, wet bulb temperature and enthalpy parameters
- UL- V0 flammability rating

Typical Installation Locations

- Ventilation ducts
- Walls
- Wash-down areas
- Outdoor locations

Vaisala INTERCAP® Humidity and Temperature Transmitter Series HMDW80 measure relative humidity and temperature in various building automation applications. Transmitters combine easy installation and reliable operation with a low requirement for maintenance.

The versatile HMDW80 series includes transmitters for wall and duct mounting, IP65-classified transmitters for humid areas, and transmitters with a radiation shield for outdoor use. It also includes temperature-only transmitters and transmitters with an optional display.

Calculated humidity parameters – dew point temperature, wet bulb temperature, and enthalpy – are also available.

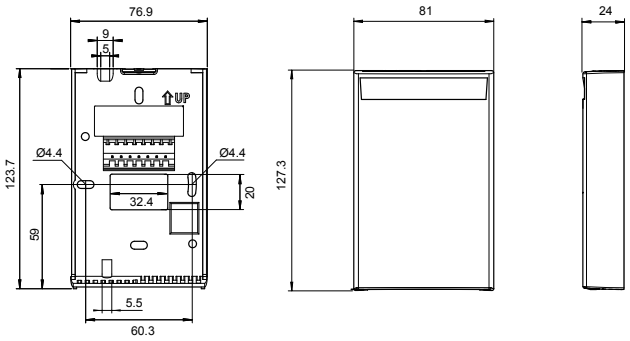
Easy Installation

HMDW80 series transmitters are optimized for easy installation. There are no loose parts, screws are retained in the enclosure, all connectors are clearly labeled, and the connectors are within easy reach.

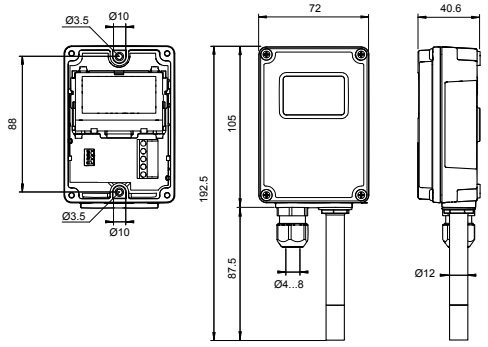
The duct mount transmitters are well suited to a variety of duct sizes, the outdoor transmitters can be mounted directly onto a wall or pole without any extra accessories, and the wall mount transmitters can be installed without the need to make holes in the transmitter enclosure.

Reliable Operation

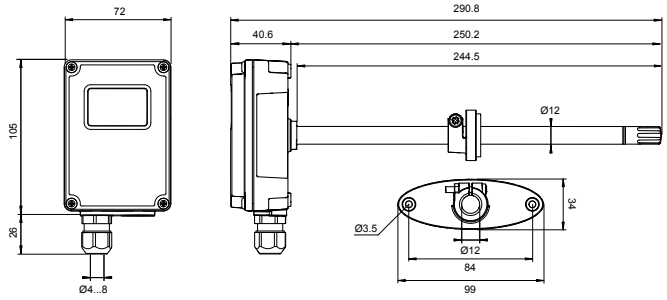
HMDW80 series transmitters require minimal maintenance thanks to their excellent sensor stability and high-quality materials. If necessary, the INTERCAP® sensor can be easily exchanged in the field with minimum downtime.



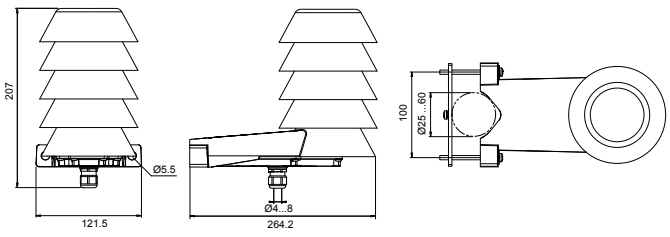
HMW82/83 RH+T and TMW82/83 T-only transmitters for wall-mounting



HMW88/89(D) RH+T transmitters for measurements in wet areas



HMD82/83(D) and TMD82/83 RH+T and T-only transmitters for ducts



HMS82/83 RH+T transmitters for outdoor measurements

Technical Data

Models

Model number	Type	Output	Special Features	Ingress Protection
TMW82	Wall-mount, T-only	2-wire, current output		IP30
TMW83	Wall-mount, T-only	3-wire, voltage output		IP30
HMW82	Wall-mount, RH+T	2-wire, current output		IP30
HMW83	Wall-mount, RH+T	3-wire, voltage output		IP30
HMW88	Wall-mount, RH+T	2-wire, current output	Calculated parameters*	IP65
HMW88D	Wall-mount, RH+T	2-wire, current output	Display, calculated parameters*	IP65
HMW89	Wall-mount, RH+T	3-wire, voltage output	Calculated parameters*	IP65
HMW89D	Wall-mount, RH+T	3-wire, voltage output	Display, calculated parameters*	IP65
TMD82	Duct-mount, T-only	2-wire, current output		IP65
TMD83	Duct-mount, T-only	3-wire, voltage output		IP65
HMD82	Duct-mount, RH+T	2-wire, current output	Calculated parameters*	IP65
HMD82D	Duct-mount, RH+T	2-wire, current output	Display, calculated parameters*	IP65
HMD83	Duct-mount, RH+T	3-wire, voltage output	Calculated parameters*	IP65
HMD83D	Duct-mount, RH+T	3-wire, voltage output	Display, calculated parameters*	IP65
HMS82	Outdoor, RH+T	2-wire, current output	Radiation shield, calculated parameters*	IP65
HMS83	Outdoor, RH+T	3-wire, voltage output	Radiation shield, calculated parameters*	IP65

*Output parameters for humidity: relative humidity, dew point temperature, wet bulb temperature, and enthalpy.

Specifications for Models HMW82/83 and TMW82/83

Performance

Operating temperature range	-5 ... +55 °C (+23 ... +131 °F)
Operating humidity range	0 … 100 %RH, non-condensing
RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy	
Temperature range	+10 ... +30 °C (+50 ... +86 °F)
0 ... 70 %RH	±3 %RH
70 ... 100 %RH	±5 %RH
Temperature range	-5 ... +10 °C, +30 ... + 55 °C (+23 ... +50 °F, +86 ... +131 °F)
0 …100 %RH	±7 %RH
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
TEMPERATURE	
Measurement range	-5 ... +55 °C (+23 ... +131 °F)
Accuracy	
+10 ... +30 °C (+50 °F ... +86 °F)	±0.5 °C (±0.9 °F)
-5 ... +10 °C, +30 ... +55 °C (+23 ... +50 °F, +86 ... +131 °F)	±1.0 °C (±1.8 °F)
Temperature sensor	Digital temperature sensor

Specifications for Models HMD82/83, TMD82/83, HMW88/89, and HMS82/83

Performance

Operating temperature range	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity range	0 ... 100 %RH
RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy	
Temperature range	+10 ... +30 °C (+50 ... +86 °F)
0 ... 90 %RH	±3 %RH
90 … 100 %RH	±5 %RH
Temperature range	-20 ... +10° C, +30 ... +60 °C (-4 ... +50 °F, +86 ... +140 °F)
0 … 90 %RH	±5 %RH
90 … 100 %RH	±7 %RH
Temperature range	-40 ... -20 °C (-40 ... -4 °F)
0 ... 100%RH	±7 %RH
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
TEMPERATURE	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy	
At +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Temperature dependence	±0.01 °C/ °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
CALCULATED PARAMETERS	
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40 ... 460 kJ/kg (-10 ... +190 BTU/lb)

Specifications for Models HMD82/83D and HMW88/89D

Performance

Operating temperature range	-5 … +60 °C (+23 … +140 °F)
Operating humidity range	0…100 %RH, non-condensing
RELATIVE HUMIDITY	
Measurement range	0 … 100 %RH
Accuracy	
Temperature range	+10 ... +30 °C (+50 ... +86 °F)
0 ... 90 %RH	±3 %RH
90 … 100 %RH	±5 %RH
Temperature range	-5 ... +10 °C, +30 ... +60 °C (+23 ... +50 °F, +86 ... +140 °F)
0 … 90 %RH	±5 %RH
90 … 100 %RH	±7 %RH
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
TEMPERATURE	
Measurement range	(Analog output scaling) -40 ... +60 °C (-40 ... +140 °F)
Operating temperature range of the display	+5 ... +60 °C (+23 ... +140 °F)
Accuracy	
At +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Temperature dependence	±0.01 °C/ °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
CALCULATED PARAMETERS	
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40…460 kJ/kg (-10…+190 BTU/lb)

Operating Environment (All Models)

Operating Environment (All Models)	See model specifications
Maximum wind/flow speed	30 m/s
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Electromagnetic compliance	EN61326-1, Industrial Environment

Mechanics

Max wire size	1.5 mm² (AWG 16)
Standard housing color	White (RAL9003)
Housing material	
HMW82/83, TMW82/83	ABS/PC (UL-V0 approved)
HMW88/89(D), HMD82/83(D), TMD82/83, HMS82/83	PC + 10%GF (UL-V0 approved)

Inputs and Outputs

Current output models (2-wire)	
Outputs	4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28VDC at 600 Ω load 10 ... 28VDC at 0 Ω load
Voltage output models (3-wire)	
Outputs	0...10 V
Load resistance	10 kΩ min
Supply voltage	18 ... 35 VDC 24 VAC ±20 % 50/60 Hz

Spare Parts and Accessories

INTERCAP® sensor	15778HM
10 pcs of INTERCAP® sensors	INTERCAPSET-10PCS
Conduit fitting + O-ring (M16x1.5 / NPT1/2 Inch)	210675SP
Conduit fitting + O-ring (M16x1.5 / PG9, RE-MS)	210674SP
Fastening set HMS80	237805
Porous PTFE Filter	DRW239993SP
Membrane Filter	ASM210856SP
Terminal Block, Blue	236620SP
HMD80 display lid	ASM210793SP

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HMS80 Series Humidity and Temperature Transmitters for Outdoor Measurements in Building Automation Applications

HMS80 Series Humidity and Temperature Transmitters with integrated radiation shields.

Features/Benefits

- Reliable outdoor transmitters with integrated radiation shields
- ±3 %RH accuracy
- User-exchangeable INTERCAP® sensor for easy field replacement
- Default output parameters are relative humidity and temperature. Dew point temperature, wet bulb temperature, and enthalpy outputs selectable using dip switches.
- Options for both current and voltage outputs
- Ingress protection IP65

Vaisala INTERCAP® Humidity and Temperature Transmitter Series HMS80 are designed for outdoor measurements in various building automation applications. These ±3% transmitters include an integrated radiation shield to reduce the influence of solar radiation on temperature and humidity measurements.

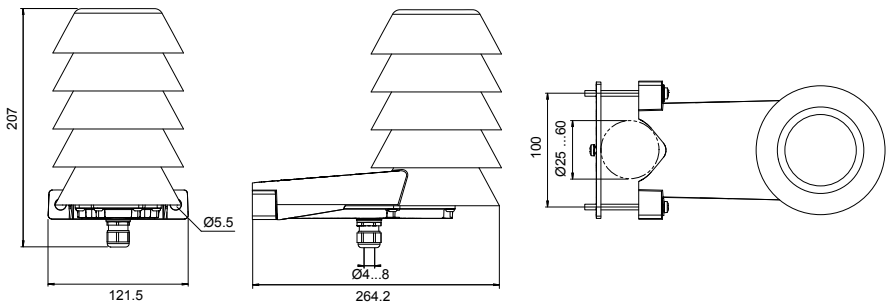
For fast and convenient configuration, the most popular control parameters in free cooling control – dew point temperature, wet bulb temperature, and enthalpy – are selectable using dip switches.

Low Maintenance

HMS80 series transmitters require minimal maintenance thanks to their excellent sensor stability and high-quality materials. If necessary, the INTERCAP® sensor can easily be replaced in the field with minimum downtime.

Easy Installation

HMS80 transmitters are easy to install. They can be mounted directly onto a wall or pole without any extra accessories. There are no loose parts, screws are retained in the enclosure, all connectors are clearly labeled, and the connectors are within easy reach.



Technical Data

Models

MODEL NUMBER	TYPE	OUTPUT	INGRESS PROTECTION
HMS82	Outdoor, RH+T	2-wire, current output	IP65
HMS83	Outdoor, RH+T	3-wire, voltage output	IP65

Performance

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy	
Temperature range	+10 ... +30 °C (+50 ... +86 °F)
0 ... 90 %RH	±3 %RH
90 … 100 %RH	±5 %RH
Temperature range	-20 ... +10 °C, +30 ... +60 °C (-4 ... +50 °F, +86 ... +140 °F)
0 … 90 %RH	±5 %RH
90 … 100 %RH	±7 %RH
Temperature range	-40 ... -20 °C (-40 ... -4 °F)
0 ... 100%RH	±7 %RH
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
TEMPERATURE	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy	
At +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Temperature dependence	±0.01 °C/ °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
CALCULATED PARAMETERS	
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40 ... 460 kJ/kg (-10 ... +190 BTU/lb)
Accuracy of the calculated parameters should be calculated at the actual condition based on the relative humidity and temperature specification.	
Accuracy at 20°C (68°F) and 80%RH:	
Dew point	±0.9 °C (1.6 °F)
Wet bulb temperature	±0.7 °C (1.3 °F)
Enthalpy	±2kJ/kg (0.9 BTU/lb)

Operating Environment

Operating temperature range	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity range	0 ... 100 %RH
Maximum wind/flow speed	30 m/s
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Electromagnetic compliance	EN61326-1, Industrial Environment

Mechanics

Max wire size	1.5 mm² (AWG 16)
Standard housing color	White (RAL9003)
Housing material	PC + 10%GF (UL-V0 approved)

Inputs and Outputs

Current output model HMS82 (2-wire)	
Outputs	4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28VDC at 600 Ω load 10 ... 28VDC at 0 Ω load
Voltage output model HMS83 (3-wire)	
Outputs	0...10 V
Load resistance	10 kΩ min
Supply voltage	18 ... 35 VDC 24 VAC ±20 % 50/60 Hz

Spare Parts and Accessories

INTERCAP® sensor	15778HM
10 pcs of INTERCAP® sensors	INTERCAPSET-10PCS
Conduit fitting + O-ring (M16x1.5 / NPT1/2 Inch)	210675SP
Conduit fitting + O-ring (M16x1.5 / PG9, RE-MS)	210674SP
Fastening set HMS80	237805
Membrane Filter	ASM210856SP
Terminal Block, Blue	236620SP

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HMD42/53 Humidity and Temperature Transmitters for Ducts in Commercial HVAC Applications

Features/Benefits

- Designed for building automation applications
- ±3 %RH accuracy
- Full 0 ... 100 %RH measurement range
- -20 ... +60 °C (-4 ... +140 °F) operating range
- IP65 (NEMA 4) metal housing
- Excellent stability and high reliability
- Fully interchangeable Vaisala INTERCAP® Sensor
- Variety of analog signal outputs available

The duct mounted Vaisala INTERCAP® Humidity and Temperature Transmitters HMD42 and HMD53 are designed for building automation applications. They combine reliable operation with excellent stability, providing low cost of ownership to the user.

Flexibility in Humidity and Temperature Measurement

The HMD42/53 transmitters measure humidity with a ±3 %RH accuracy and temperature with a ±0.4 °C (±0.72 °F) accuracy. They feature various selectable analog output signals and they can be powered by either AC or DC voltage.

Easy Maintenance

The HMD42/53 humidity transmitters use Vaisala INTERCAP® Sensor - the interchangeable capacitive humidity sensor. The transmitters require no recalibration if the sensor is changed. This means great savings in overall maintenance costs.

Reliable Performance in Harsh Environments

The duct mount HMD42/53 transmitters can be installed in various measurement environments due to the robust IP65 (NEMA4) rated metal enclosure, which protects the sensor from dust and splashes of water. The wide measurement temperature range from -20 °C to +60 °C (-4 ... +140 °F) covers most HVAC applications.

Typical Applications

- Office buildings
- Retail spaces
- Governmental buildings
- Educational facilities
- Sport and event complexes
- Hotels and conference centers
- Airports
- Metro stations

Technical Data

Relative Humidity

Measurement range	0 ... 100 %RH
Typical accuracy	
Temperature range	0 ... +40 °C (+32 ... +104 °F)
0 ... 90 %RH	±3 %RH
90 ... 100 %RH	±5 %RH
Temperature range	-20 ... 0 °C, +40 ... +60 °C
	(-4 ... +32 °F, +104 ... +140 °F)
0 ... 90 %RH	±5 %RH
90 ... 100 %RH	±7 %RH
Humidity sensor	Vaisala INTERCAP®
Stability	±2 %RH / 2 years
Response time at 20 °C (+68 °F), 90 % response	15 s

Temperature

Measurement range	-20 ... +60 °C (-4 ... +140 °F)
Output scale	-40 ... +60 °C (-40 ... +140 °F)
Accuracy	
0 ... +40 °C (+32 ... +104 °F)	±0.4 °C (±0.72 °F)
-20 ... 0 °C, +40 ... +60 °C	
(-4 ... +32 °F, +104 ... +140 °F)	±0.6 °C (±1.1 °F)
Sensor	Pt1000 RTD Class F0.3 IEC 60751

General - HMD42

Supply voltage	10 ... 35 VDC (R_L = 0 ohm)
	20 ... 35 VDC (R_L = 500 ohm)
Output signal	4 ... 20mA

General - HMD53

Supply voltage range depends on the selected output signal

	DC	AC
0 … 1V	10 … 35V	9 … 24V
0 … 5V	14 … 35V	12 … 24V
0 … 10V	19 … 35V	16 … 24V
WITH OPTIONAL CURRENT MODULE		
0 ... 20 mA (R_L= 0 ohm)	10 … 35V	11 … 24V
**0 … 20 mA (R_L=500 ohm)	20 … 35V	17 … 24V
Power consumption @ 24VAC		12mA typical

**Optional temperature scales are available on request.

General

Operating temperature range	
electronics	-5 ... +55 °C (+23 ... +131 °F)
probe	-20 ... +60 °C (-4 ... +140 °F)
Storage temperature range	-40 ... +60 °C (-40 ... +140 °F)
Maximum flow speed	50 m/s
Housing material	
probe	stainless steel
electronics	cast aluminium
Housing classification	IP65 (NEMA 4)
Connections	screw terminal 0.5 ... 1.5 mm²
Cable thread-through bushing for 7 ... 10 mm	
(PG9) included	(18941HM)
Complies with EMC standard EN61326 and EN55022	

Accessories

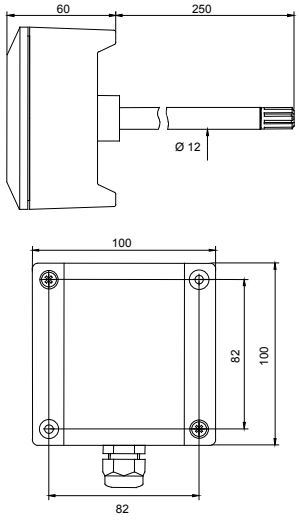
Armoured cable gland	10528HM
Current module (for HMD53)	18945HM

Spare Parts

Vaisala INTERCAP sensor, 1 piece	15778HM
Vaisala INTERCAP sensor, 10 pcs	INTERCAPSET-10PCS
Membrane filter	DRW010525
Sintered filter	HM46670SP

Dimensions

Dimensions in mm



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HMM100 Humidity Module for Environmental Chambers

The Vaisala HUMICAP® Humidity Module HMM100.

Features/Benefits

- Full temperature compensation over the operating temperature range of -70 °C ... +180 °C
- High temperature tolerance, also suitable for heat-sterilization
- Excellent measurement accuracy with Vaisala HUMICAP® 180R sensor
- Durable
- Easy field calibration by trimmers
- Maintenance-free
- Easy to install
- Applications: test chambers, incubators

The Vaisala HUMICAP® Humidity Module HMM100 is an open frame module for integration into environmental chambers. The modules provide a single analog output channel for relative humidity (RH) or dew point (T_d).

Two probes are available, one made of plastics, the other of stainless steel. Several cable lengths up to 3 meters are available. Both the probes have the Vaisala HUMICAP® 180R sensor which ensures excellent measurement accuracy.

Robust and Reliable

The HMM100 probe works in freezing conditions (-70 °C) and also in temperatures up to +180 °C. The HMM100 is easy to install and the probe can be freely placed in a test chamber as the speed of airflow does not affect the measurement.

Maintenance-free

Compared to psychrometers, the HMM100 is practically maintenance-free. There is no wick that needs changing and there is no need for a water tank or water pump. Thus, environmental stress screening can be done reliably.

Accessories

The accessories available are a component board mounting bracket with a lid, probe clamp, USB-cable for service use, a module housing and a probe mounting flange.

Technical Data

Performance

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy (incl. non-linearity, hysteresis and repeatability)	
temperature range	-20 ... +40 °C
0 ... 90 %RH	±2 %RH
90 ... 100 %RH	±3 %RH
temperature range	-40 ... -20 °C, +40 ... +180 °C
0 ... 90 %RH	±2.5 %RH
90 ... 100 %RH	±3.5 %RH
Factory calibration uncertainty (+20 °C)	±1.5 %RH
Humidity sensor	Vaisala HUMICAP® 180R
DEW POINT TEMPERATURE	
Measurement range	-20 ... +100 °C (-4 ... +212 °F)T_d
Accuracy (incl. non-linearity, hysteresis and repeatability when dew point depression <20 °C (Ambient temperature - dew point)	±2 °C T_d

Operating Environment

Operating temperature range	
component board	-5 ... +55 °C (+23 ... +131 °F)
stainless steel and plastic probe	-70 ... +180 °C (-94 ... +356 °F)
porous PTFE filter stainless steel, sintered filter	-70 ... +180 °C (-94 ... +356 °F)
plastic grid, membrane filter	-20 ... +80 °C (-4 ... +176 °F)
Electromagnetic compatibility	Applicable parts of EN61326-1, Generic Environment

Input and Outputs

Operating voltage	
2-wire model	24 VDC
3-wire model	10 ... 35 VDC or 9 ... 24 VAC 15 ... 35 VDC or 14 ... 24 VAC when 0 ... 10 V output is used
Power consumption	6 mA
Analog output types (1 output selectable)	
2-wire model	4 ... 20 mA (loop-powered)
3-wire model	0 ... 20 mA, 0 ... 1 V/5 V/10 V
Max. wire size	0.5 ... 1. 5 mm^2 (AWG)
Service port	M8 connector for USB cable

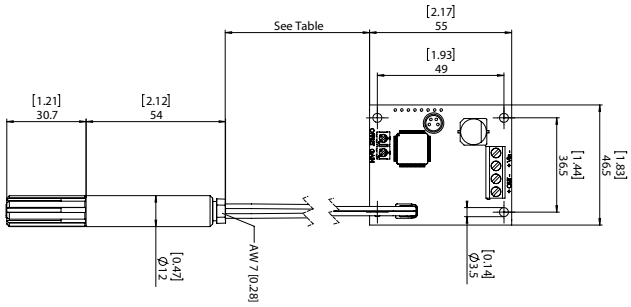
Mechanics

Service cable connector	M8 series 4-pin (male)
Probe diameter	12 mm
Probe cable lengths	0.6/1.55/2.9 m
Probe material	
plastics	PPS
stainless steel	AISI316/PPS
Probe mounting clamp	AISI316
Mounting bracket material	
lid	ABS/PC
bottom plate	Al
Module housing material	ABS/PC (cover)

Options and Accessories

Humidity sensor	HUMICAP180R
Membrane filter	10159HM
Plastic grid filter	6221
Porous PTFE filter	219452SP
Stainless steel sintered filter	HM47280SP
Mounting bracket with lid	225979
Module housing (IP65)	226060
Probe mounting flange	226061
Probe mounting clamp set (10 pcs)	226067
USB cable	226068

Dimensions



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Vaisala INTERCAP® Humidity and Temperature Probe HMP60

The HMP60 for extreme conditions.

Features/Benefits

- Miniature-size humidity probe
- Low power consumption
- Measurement range: 0 ... 100 %RH; -40 ... +60°C
- Cable detachable with standard M8 connector
- Rugged metal housing
- Interchangeable Vaisala INTERCAP® Sensor
- Optional RS485 digital output

  Optional dew point output
- Applications: volume applications, integration into other manufacturers' equipment, glove boxes, greenhouses, fermentation chambers, data loggers

HMP60

The HMP60 is a simple, durable and cost-effective humidity probe. It is suitable for volume applications, integration into other manufacturers' equipment, incubators, glove boxes, greenhouses, fermentation chambers, and data loggers.

Easy Installation

The probe cable has a screw-on quick connector for easy installation. Different cable lengths are available. Also other compatible M8 series cables can be used. Accessories are available for different installation needs.

Low Current Consumption

The HMP60 is suitable for battery-powered applications because of its very low current consumption.

Several Outputs

There are two configurable voltage outputs with relative humidity, temperature or dew point scaling. Four voltage output ranges are available.

Rugged Design

The HMP60 is designed for extreme conditions. The stainless steel body of the HMP60 is classified as IP65. The probe has a sealed structure and the sensor is protected by a membrane filter and a plastic grid, or optionally by a stainless steel filter.

Recalibration Not Needed

The Vaisala INTERCAP® Sensor is interchangeable. No recalibration is required; the sensor can simply be replaced, also in the field.

Technical Data

Performance

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Typical accuracy	
temperature range	0 ... +40 °C
0 ... 90 %RH	±3 %RH
90 ... 100 %RH	±5 %RH
temperature range	-40 ... 0 °C, +40 ... +60 °C
0 ... 90 %RH	±5 %RH
90 ... 100 %RH	±7 %RH
Humidity sensor	Vaisala INTERCAP®
TEMPERATURE	
Measurement range	-40 ... +60 °C
Accuracy over temperature range	
+10 ... +30 °C	±0.5 °C
-40 ... +10, +30 ... +60 °C	±0.6 °C
DEW POINT	
Measurement range	-40 ... +60 °C
Typical accuracy	
temperature range	0 ... +40 °C
when dew point depression < 15 °C	±2 °C
temperature range	-40 ... 0 °C, +40 ... +60 °C
when dew point depression < 10 °C	±3 °C
dew point depression = ambient temperature - dew point	

Inputs and Outputs

Operating voltage	5 ... 28 VDC / 8 ... 28 VDC with 5 V output
(Use lowest available operating voltage to minimize heating.)	8 ... 28VDC with loop power converter
Current consumption	1 mA average, max. peak 5 mA
Start-up time	
probes with analog output	4 s at operating voltage 13.5 ... 16.5 VDC 2 s at other valid operating voltages
probes with digital output	1 s
Outputs	
2 channels	0 ... 1 VDC/0 ... 2.5 VDC / 0 ... 5 VDC/1 ... 5 VDC
1-channel loop-power converter (separate module, compatible with humidity accuracy only)	4 ... 20 mA
digital output (optional)	RS485 2-wire half duplex
External loads	
0 ... 1 V	R_L min 10 kΩ
0 ... 2.5 V /0 ... 5 V	R_L min 50 kΩ

Operating Environment

Operating temperature	-40 ... +60 °C
Electromagnetic compatibility	EN 61326-1: Electrical equipment for measurement, control and laboratory use – EMC requirements – for use in industrial locations.

Mechanics

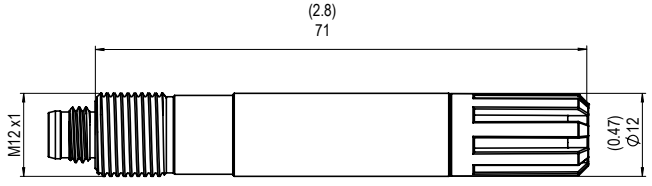
Materials	
body	stainless steel (AISI 316)
grid filter	chrome coated ABS plastic
cable	polyurethane or FEP
Housing classification	IP65
Body thread	MI2x1 / 10 mm
Cable connector	4-pin M8 (IEC 60947-5-2)
Weight	
probe	17 g
probe with 0.3 m cable	28 g

Options and Accessories

Vaisala INTERCAP® Sensor, 1 piece	15778HM
Vaisala INTERCAP® Sensor, 10 pcs	INTERCAPSET-10PCS
Sensor protection	
plastic grid	DRW010522
membrane filter	DRW010525
stainless steel sintered filter	HM46670SP
4 ... 20mA loop power converter	UI-CONVERTER-1CB
Mounting bracket for converter	225979
Plastic M12 installation nuts, pair	18350SP
USB cable for PC connection	219690
Probe mounting clamp set, 10 pcs	226067
Probe mounting flange	226061
Connection cables	
0.3 m PU	HMP50Z032SP
3 m PU	HMP50Z300SP
180 °C 3 m FEP	226902SP

Dimensions

in mm (inches)



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Vaisala HUMICAP® Humidity and Temperature Probe HMP110

The HMP110 with excellent stability and high chemical tolerance.

Features/Benefits

- Miniature-size humidity transmitter
- Low power consumption and fast start-up for battery powered applications
- Measurement range: 0 ... 100 %RH; -40 ... +80°C
- Cable detachable with standard M8 quick connector
- Reliable: Latest generation HUMICAP® 180R sensor for best stability and high chemical tolerance. IP65 metal housing.
- Optional RS485 digital output
- Traceable: Comes with calibration certificate. ±1.5 %RH measurement accuracy (0 ... 90 %RH)
- HMP110R replacement probe service available for easy maintenance
- Optional dew point calculation

The HMP110 is a trouble-free and cost-effective humidity transmitter with high accuracy and good stability. It is suitable for volume applications or integration into other manufacturers' equipment. The HMP110 is also suitable for glove boxes, greenhouses, fermentation and stability chambers, data loggers, and incubators.

Easy Installation

The probe cable has a screw-on quick connector for easy installation. Different cable lengths and accessories are available.

Low Current Consumption

HMP110 is suitable for battery-powered applications because of its very low current consumption. It also has a fast start-up time.

Several Outputs

The temperature measurement is a standard feature, dew point measurement is optional. Three standard voltage outputs are available.

Robust Design

The stainless steel body of the HMP110 is classified as IP65. Thus, it survives rough conditions. The HMP110 has high chemical tolerance because of the HUMICAP® 180R sensor.

Easy Maintenance

Maintaining measurement traceability is easy using the HMP110R replacement probe. We send you a replacement probe, you detach the old probe and send it back to us. In this way the measurement is available at all times without interruptions.

Technical Data

Performance

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy (incl. non-linearity, hysteresis and repeatability)	
temperature range	0 ... +40 °C
0 ... 90 %RH	±1.5 %RH
90 ... 100 %RH	±2.5 %RH
temperature range	-40 ... 0 °C, +40 ... +80 °C
0 ... 90 %RH	±3.0 %RH
90 ... 100 %RH	±4.0 %RH
Factory calibration uncertainty (+20 °C)	
0 ... 90 %RH	±1.1 %RH
90 ... 100 %RH	±1.8 %RH
Humidity sensor	Vaisala HUMICAP® 180R
Stability	±2 %RH over 2 years
TEMPERATURE	
Measurement range	-40 ... +80 °C
Accuracy over temperature range	
0 ... +40 °C,	±0.2 °C
-40 ... 0 °C, +40 ... +80 °C	±0.4 °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
DEW POINT	
Measurement range	-40 ... +80 °C
Accuracy (incl. non-linearity, hysteresis and repeatability)	
temperature range	0 ... +40 °C
when dew point depression < 15 °C	±1 °C
when dew point depression 15 ... 25 °C	±2 °C
temperature range	-40 ... 0 °C, +40 ... +80 °C
when dew point depression < 15 °C - dew point depression = ambient temperature - dew point	±2 °C

Inputs and Outputs

Operating voltage	5 ... 28 VDC / 8 ... 28 VDC with 5 V output
(Use lowest available operating voltage to minimize heating)	8 ... 28 VDC with loop power converter
Current consumption	1 mA average, max. peak 5 mA
Start-up time	
probes with analog output	4 s at operating voltage 13.5 ... 16.5 VDC 2 s at other valid operating voltages
probes with digital output	1 s
Outputs	
2 channels	0 ... 1 VDC / 0 ... 2.5 VDC / 0 ... 5 VDC / 1 ... 5 VDC
1-channel loop-power converter (separate module, compatible with humidity accuracy only)	4 ... 20 mA
digital output (optional)	RS485 2-wire half duplex
External loads	
0 ... 1 V	R_L min 10 kΩ
0 ... 2.5 V /0 ... 5 V	R_L min 50 kΩ

Operating Environment

Operating temperature range	-40 ... +80 °C
Electromagnetic compatibility	EN 61326-1: Electrical equipment for measurement, control and laboratory use – EMC requirements – for use in industrial locations.

Mechanics

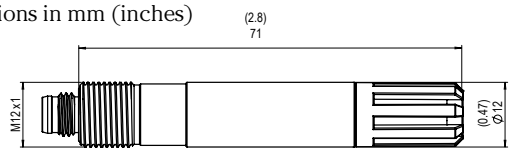
Materials	
body	stainless steel (AISI 316)
grid filter	chrome coated ABS plastic
cable	polyurethane or FEP
Housing classification	IP65
Body thread	MI2x1 / 10 mm
Cable connector	4-pin M8 (IEC 60947-5-2)
Weight	
probe	17 g
probe with 0.3 m cable	28 g

Options and Accessories

Sensor protection	
plastic grid	DRW010522SP
membrane filter	DRW010525SP
stainless steel sintered filter	HM46670SP
4 ... 20 mA loop power converter	UI-CONVERTER-1CB
Mounting bracket for converter	225979
Plastic M12 installation nuts, pair	18350SP
USB cable for PC connection	219690
Probe mounting clamp set, 10 pcs	226067
Probe mounting flange	226061
Connection cables	
standard 0.3 m	HMP50Z032SP
standard 3 m	HMP50Z300SP
80 °C 1.5 m	225777SP
80 °C 3 m	225229SP
180 °C 3 m FEP	226902SP

Dimensions

Dimensions in mm (inches)



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HM70 Hand-Held Humidity and Temperature Meter for Spot-Checking Applications

The Vaisala HUMICAP® Hand-Held Humidity and Temperature Meter HM70 is a high-performance, portable humidity reference that is exciting to use.

Features/Benefits

- Multilingual user interface
- Shows measurement trends graphically
- Proven Vaisala HUMICAP® Sensor technology
- 3 probe alternatives, temperature measurement ranges between -70 and +180 °C
- Multiprobe operation; dew point and CO_2 probes can also be connected
- 2 probes can be connected simultaneously
- Displays various humidity parameters
- Sensor preheat and chemical purge options for demanding conditions
- NIST traceable (certificate included)

The Vaisala HUMICAP® Hand-Held Humidity and Temperature Meter HM70 is designed for demanding humidity measurements in spot-checking applications. It is also ideal for field checking and calibration of Vaisala's fixed humidity instruments.

The HM70 incorporates the latest generation of the Vaisala HUMICAP® Sensor. It is reliable and has better than ever long-term stability. Additionally, it has a sensor that copes well with chemical interference and provides accuracy that lasts in demanding conditions.

The chemical purge option maintains measurement accuracy in environments with high concentrations of chemicals. The sensor preheat option reduces measurement delays as it keeps the sensor dry when the probe is inserted into hot and humid processes.

Three Probes to Choose from

The HMP75 is a general purpose probe whereas the HMP76 is a long, stainless steel probe especially suitable for spot-checking in ducts. The HMP77 is a small probe at the end of a 5-meter cable. The probe is ideal for difficult-to-reach areas and for on-site calibration of Vaisala's process transmitters.

In addition, the HM70 supports the use of Vaisala's dew point, carbon dioxide and moisture in oil probes, allowing measurements in several multiparameter applications.

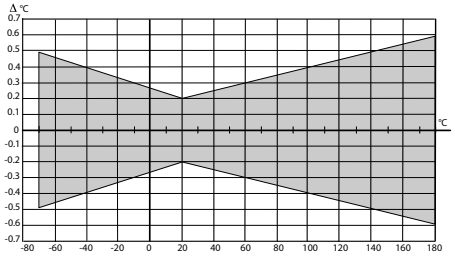
MI70 Link

The optional MI70 Link Windows® software and the USB connection cable form a practical tool for transferring logged data and real time measurement data from the HM70 to a PC.

Technical Data

HMP75, HMP76 and HMP77 Probes Measured Variables

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy (including nonlinearity, hysteresis and repeatability)	
at +15 ... +25 °C (+59 ... +77 °F)	±1 %RH (0 ... 90 %RH)
	±1.7 %RH (90 ... 100 %RH)
at -20 ... +40 °C (-4 ... +104 °F)	±(1.0 + 0.008 x reading) %RH
at -40 ... +180 °C (-40 ... +356 °F)	±(1.5 + 0.015 x reading) %RH
Factory calibration	±0.6 %RH (0 ... 40 %RH)
uncertainty (+20 °C / +68 °F)	±1.0 %RH (40 ... 97 %RH)
	(Defined as ±2 standard deviation limits.)
Response time (90%) at +20 °C (+68 °F) in still air	
HMP75 (with standard plastic grid)	17 s
HMP76 (with standard sintered bronze filter)	60 s
HMP77 (with standard plastic grid and stainless steel netting)	50 s
Sensor	HUMICAP® 180R
	HUMICAP® 180RC (chemical purge, sensor preheat)
Typical long-term stability	better than 1 %RH / year
TEMPERATURE	
Measurement range	
HMP75	-20 ... +60 °C (-4 ... +140 °F)
HMP76	-50 ... +120 °C (-58 ... +248 F)
short time	-50 ... +180 °C (-58 ... +356 °F)
HMP77	-70 ... +180 °C (-94 ... +356 °F)
Accuracy at +20 °C (+68 °F)	±0.2 °C (±0.36 °F)
Accuracy over temperature range	(see graph)



Temperature sensor	Pt100 RTD Class F0.1 IEC 60751

Probe General

Operating temperature range for electronics	-40 ... +60 °C
	(-40 ... +140 °F)
Housing classification	IP65 (NEMA 4)
Housing material	ABS/PC blend
Probe material	Stainless steel (AISI316L)
Cable length between probe and indicator	1.9 m

MI70 Measurement Indicator Indicator General

Menu languages	English, Chinese, French, Spanish, German, Russian, Japanese, Swedish, Finnish
Display	LCD with backlight, graphic trend display of any parameter, character height up to 16 mm
Max. no. of probes	2
Power supply	Rechargeable NiMH battery pack with AC-adapter or 4xAA-size alkalines, type IEC LR6 0
Analog output	0... 1 VDC
Output resolution	0.6 mV
PC interface	MI70 Link software with USB or serial port cable
Data logging capacity	2700 points
Alarm	audible alarm function
Operating temperature range	-10 ... +40 °C (+14 ... +104 °F)
Operating humidity range	non-condensing
Housing classification	IP54
Battery operation time	
Continuous use	48 h typical at +20 °C (+68 F)
Data logging use	up to a month, depending on logging interval
Electromagnetic compatibility	Complies with EMC standard EN61326-1, Portable Equipment

MI70 Indicator + Probe = HM70

ACCESSORIES	
Carrying cases	
for MI70 and HMP75/77 probe	MI70CASE
for MI70 and HMP75/76 probe	MI70CASE2
Transmitter connection cables for	
HMT330 & HMT120/130	211339
HMT310	DRW216050
HMW90 Series	219980
HMD/W60/70 Series	HMA6070
MI70 Link software with USB cable	219687
MI70 Link software with serial port cable	MI70LINK
Analog output cable	27168ZZ
Sensor protection HMP75	
Plastic PC grid (HMP75 standard)	6221
Membrane filter	10159HM
Sintered bronze filter	DRW212987SP
HMP76/77	
Plastic PPS grid	DRW010276SP
Sintered stainless steel filter	HM47280SP
Sintered bronze filter (HMP76 standard)	DRW212987SP
PPS grid with SS netting (HMP77 standard)	DRW010281SP

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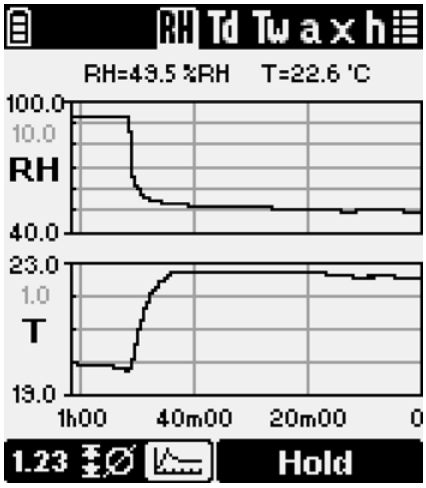
Vaisala HUMICAP® Hand-Held Humidity and Temperature Meter HM40

The HM40 Humidity Meter can be chosen either in standard or remote probe version.



The graph clearly indicates when the readings have stabilized.

The HM40 is a compact and portable humidity meter at hand everywhere you go. It is an ideal spotchecking tool that is easy to use and provides reliable measurement. It can be used for a wide range of various portable measurement applications. According to a user's needs, the meter is available in two models: standard and with a remote probe.

Simple and easy to use

The HM40 includes a user-friendly, large graphical display and easy-to-use push buttons. The user interface is simple and intuitive to use, and available in 10 languages. Also, many other settings can be modified by the user to best suit his individual needs. In addition to relative humidity and temperature, the HM40 provides five calculated humidity parameters, all available in both metric and nonmetric units.

The meter is powered by 2 AA-sized batteries. An external NiMH battery recharger with USB connection and rechargeable NiMH batteries are offered as an option. Each HM40 comes also with a handy belt clip and a case.

Easy recalibration

The calibration of the HM40 is easy: just send the meter back to a Vaisala Service Center for recalibration or simply plug in a recently calibrated interchangeable HMP113 measurement probe. Alternatively, the HM40 can be user calibrated on site using a humidity reference, e.g. the Vaisala Humidity Calibrator HMK15.

Benefits

- Compact and portable, easy to use hand-held meter
- Versatile meter with wide measurement range and multiple calculated parameters
- Standard and remote probe models available
- Ideal for spot-checking, on the go

Features

- Humidity measurement range 0 ... 100 %RH
- Operating temperature range -10 °C ... +60 °C
- Incorporates the proven Vaisala HUMICAP® 180R Sensor
- The interchangeable measurement probe HMP113 can be user calibrated
- Graphical display indicates when measurement has stabilized
- Hold-button to freeze the screen and save the reading
- Multilingual user interface with 10 languages (EN, DE, FR, JA, ZH, PT, ES, RU, FI, SV)

Technical Data

Performance

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy (including non-linearity, hysteresis, and repeatability):	
at 0 ... +40 °C (+32 ... +104 °F)	±1.5 %RH (0 ... 90 %RH) ±2.5 %RH (90 ... 100 %RH)
at -10 ... 0 °C and +40 ... +60 °C (+14 ... +32 °F and +104 ... +140 °F)	±3.0 %RH (0 ... 90 %RH) ±4.0 %RH (90 ... 100 %RH)
Factory calibration uncertainty at +20 °C (+68 °F)	±1.5 %RH
Humidity measurement response time (90%) with plastic grid filter	17 s
Stability	±2 %RH over 2 years
Humidity sensor	HUMICAP® 180R
TEMPERATURE	
Measurement range	-10 ... +60 °C (14 ... 140 °F)
Accuracy over temperature range:	
at 0 ... +40 °C (+32 ... +104°F)	±0.2 °C (0.36 °F)
at -10 ... 0 °C and +40 ... +60 °C (+14 ... 32 °F and +104 ... +140 °F)	±0.4 °C (0.72 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751

Mechanics

Weight (with alkaline batteries)	
With standard probe	230 g
With handle	330 g
Materials	
Meter body	PC/ABS blend, acrylic display lens
Probe holder	PC/ABS blend (grey)
Probe	PC/ABS blend (white)
Filter	PC (glass reinforced)
Housing classification	IP54
Mechanical drop endurance	0.4 m with probe attached 1.0 m without the probe

General

Power-up time	< 3 s
Batteries	2 × AA sized, 1.5 V
Calculated parameters	Td, Tw, a, x, h
Menu languages	English, German, French, Finnish, Spanish, Swedish, Chinese (simplified), Russian, Japanese, Portuguese
Display	LCD (140 x 160 pixels)
Operation time	typical 100 hours (without backlight)
Operation temperature range	-10 ... +60 °C (+14 ... +140 °F)
Storage temperature range	-30 ... +70 °C (-22 ... +158 °F)
Electromagnetic compatibility (EMC)	European Union directive EN61326-1 for portable equipment

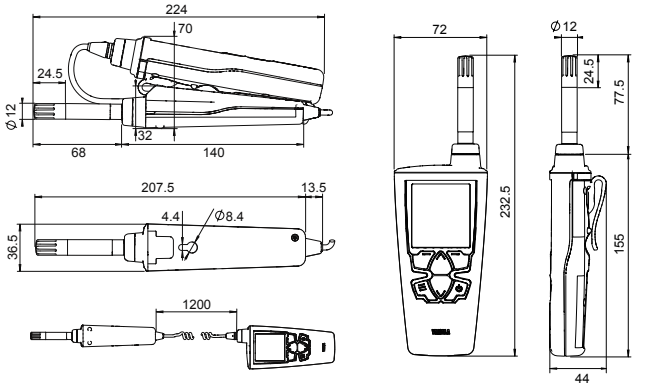
Accessories and Spare Parts

HMP113 probe for HM40*	
HM40 handle and cable	HM40HANDLE
Plastic nut for HMP113 attachment (3 pcs)	DRW238590SP
NiMH rechargeable batteries (4 pcs)	229247SP
External battery recharger with USB connection and 2 batteries	229249SP
Case for HM40 (indicator and probe)	235849SP
Plastic grid filter for HMP113 probe	DRW236214SP
Plastic grid with membrane filter for HMP113 probe	230727SP
Belt clip (3 pcs)	227710SP
Battery cover (3 pcs)	225688SP

** See the HM40 order form when ordering a spare probe for HM40.*

Dimensions

Dimensions in mm



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HMI41 Indicator and HMP42/HMP46 Probes

The Vaisala HUMICAP® Humidity Indicator HMI41 fitted with the Vaisala HUMICAP® Humidity and Temperature Probes HMP42 or HMP46 can be used for spot checking and field calibration applications.

In addition to displaying the humidity and temperature readings, the HMI41 indicator calculates dew point and wet bulb temperature, absolute humidity and mixing ratio.

The indicator has an easy-to-read two line liquid crystal display. The display units (metric or non-metric) are easily selected.

These features, plus fast response time, high measurement accuracy and excellent stability, as well as the unique properties of the probe chosen – either the HMP42 or the HMP46 – make the HMI41 indicator and HMP42/46 combination an ideal choice for the most demanding applications.

Features/Benefits

- RH measurement range 0 ... 100 %RH
- Temperature measurement range -40 ... +100 °C (-40 ... +212 °F), with the HMP46 only for short periods up to +180 °C (+356 °F)
- Calculates dew point, wet bulb temperature, absolute humidity and mixing ratio
- Versatile and easy-to-use
- Incorporates Vaisala HUMICAP® Sensor
- Excellent stability
- Data collection with serial line
- NIST traceable (certificate included)
- Optional carrying case and calibration cable

Vaisala HUMICAP® Humidity and Temperature Probe HMP42

The HMP42 probe can be used for spot checking humidity and temperature in applications which require an extremely thin probe. Typically the probe is used for monitoring the drying of structures during construction or after water damage. It is ideal to be used when measuring in any tight places, in ducts or chambers or, for example, under a linoleum floor.

The probe diameter is only 4 mm, allowing access into very small, tight, and hard-to-reach spaces.

Vaisala HUMICAP® Humidity and Temperature Probe HMP46

Typical applications for the HMP46 are plant maintenance, installation and inspection of air conditioning systems, production and storage areas and production processes. The HMP46 operates in full humidity range of 0 ... 100 %RH. The temperature range is from -40 to +100 °C (-40 ... +212 °F). For short periods of time, the probe can withstand temperatures up to +180 °C (+356 °F).

The HMP46 probe is solid and rugged. Its stainless steel probe is made to withstand rough handling in mechanically demanding applications. The probe's long shaft can also reach otherwise unreachable places.

High Performance Sensor

The HMP42/46 probes incorporate Vaisala HUMICAP® Sensor. This sensor has high accuracy, excellent long-term stability and negligible hysteresis. In addition, the sensor is insensitive to dust, particulate dirt and most chemicals.

The Vaisala HUMICAP® Humidity Indicator HMI41 equipped with the Vaisala HUMICAP® Humidity and Temperature Probe HMP42 – an extremely thin probe allowing access into very small, tight, hard-to-reach spaces.

The Vaisala HUMICAP® Humidity Indicator HMI41 equipped with the Vaisala HUMICAP® Humidity and Temperature Probe HMP46 – a rugged stainless steel probe for mechanically demanding and high temperature applications.

Technical Data

HMI41 Indicator

Calculated variables	dew point temperature, absolute humidity, wet bulb temperature, mixing ratio
Resolution	0.1 %RH; 0.1 °C/°F
Power supply	4 batteries, type AA (LR 6)
Battery operation time (alkaline batteries)	72 h continuous use
Auto-off function	
Operating temperature	-20 ... +60 °C (-4 ... +140 °F)
Storage temperature	-40 ... +70 °C (-40 ... +158 °F)
Display	two line LCD
Housing material	ABS plastic
Housing classification	IP53 (with connectors blocked)
Weight (incl. batteries)	300 g
Maximum measurement error of indicator at +20 °C	
humidity	±0.1 %RH
temperature	±0.1 °C (±0.18 °F)

HMP42 Probe

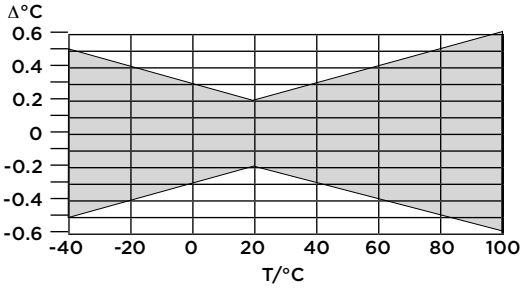
HUMIDITY

Measurement range	0 ... 100 %RH
Accuracy (incl. non-linearity, hysteresis and repeatability) at +20 °C (+68 °F)	
0 … 90 %RH	±2 %RH
90 … 100 %RH	±3 %RH
Factory calibration uncertainty (+20 °C / +68 °F)	
0 … 15 %RH	±1 %RH
15 … 78 %RH	±1.5 %RH
Temperature dependence of electronics	±0.05 %RH/°C
Typical long-term stability	better than 1 %RH per year
Response time (90%) at +20 °C in still air	30 s

TEMPERATURE

Measurement range HMP42	-40 ... +100 °C (-40 ... +212 °F)

Temperature accuracy over measurement range



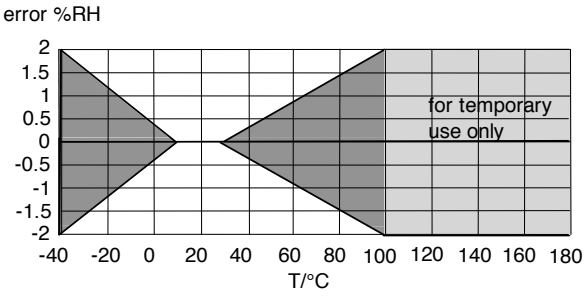
Temperature sensor	Pt100 RTD Class F0.3 IEC 60751

HMP46 Probe

HUMIDITY

Measurement range	0 ... 100 %RH, non-condensing
Accuracy (incl. non-linearity, hysteresis and repeatability) at +20 °C (+68 °F)	
0 … 90 %RH	±1 %RH
90 … 100 %RH	±2 %RH
Factory calibration uncertainty (+20 °C / +68 °F)	
0 … 15 % RH	±1 %RH
15 … 78 %RH	±1.5 %RH

Temperature Dependence

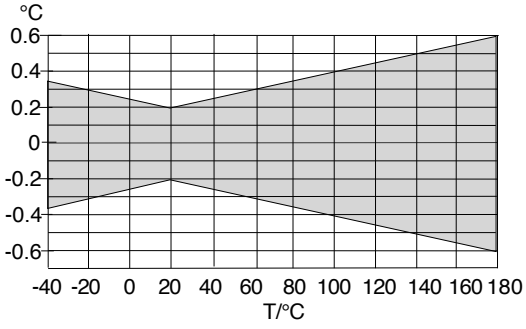


Typical long-term stability	better than 1 %RH per year
Response time (90%) at +20 °C in still air w/sintered filter	15 s

TEMPERATURE

Continuous measurement	-40 ... +100 °C (-40 ... +212 °F)
Short-term measurement	-40 ... +180 °C (-40 ... +356 °F)
Temperature accuracy at +20 °C (+68 °F)	±0.2 °C (±0.36 °F)

Temperature accuracy over the measurement range



Temperature sensor	Pt100 RTD Class F0.1 IEC 60751

Technical Data

General for Probes

Cable length	1500 mm; extended spiral cable
Operating temperature range	
for electronics	-20 ... +60 °C (-4 ... +140 °F)
Housing material	
electronics housing	ABS plastic
probe	stainless steel
Housing classification	
electronics	IP65 (NEMA 4)
HMP42 sensor protection	
steel grid	19867HM
membrane, tube set (5 pcs)	19858HM
HMP46 sensor protection	
sintered filter	0195
optional membrane filter, (max +80 °C / +176 °F)	10159HM
plastic grid, (max +80 °C / +176 °F)	6221
Weight	
HMP42	200 g
HMP46	450 g
Electromagnetic compatibility	Complies with EMC standard EN61326-1, Portable Equipment.

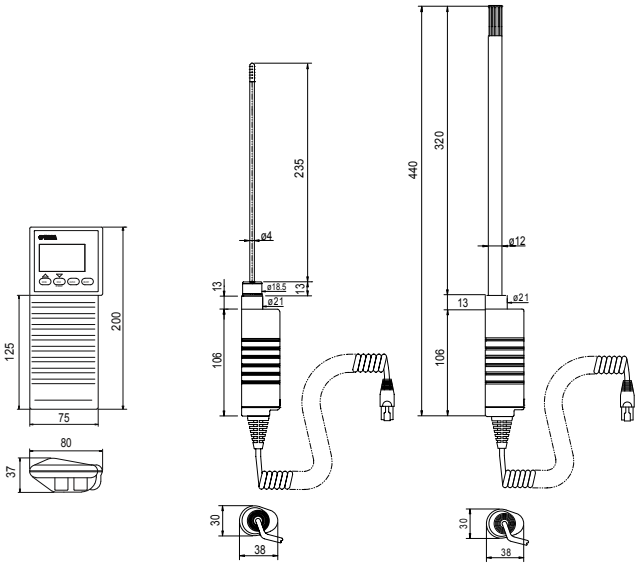
Accessories

Transmitter calibration cables	
HMT330, HMT120/130	25917ZZ
HMT360	25916ZZ
HMM210	19164ZZ
HMD/W60/70	19116ZZ
Carrying case for HMI41 & HMP42/46	
plastic	210614
aluminum	MI70CASE2
Serial communication cable	19446ZZ
HMP42	
Calibration adapter	HM37067
Rubber sleeve set	19809HM

Dimensions

Dimensions in mm.

HMI41 HMP42 HMP46



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Events

SHM40 Structural Humidity Measurement Kit

Vaisala HUMICAP® Structural Humidity Measurement Kit SHM40 offers an easy and reliable solution for humidity measurements in concrete and other structures.

Concrete dries unevenly and is usually drier on the surface, consequently it is important to measure beneath the surface conditions. The borehole method provides information about the humidity profile under the surface. In this method, a humidity probe is left in the borehole until the humidity in the hole has reached an equilibrium state and the stabilized values can be read.

SHM40 Is All You Need for Borehole Humidity Measurement

The Vaisala HUMICAP® Structural Humidity Measurement Kit SHM40 is an ideal solution for the borehole method. The starter kit is comprised of an HMP40S probe, HM40 indicator and accessories for the borehole method in a weather-proof case, optimized for use in harsh and humid construction sites.

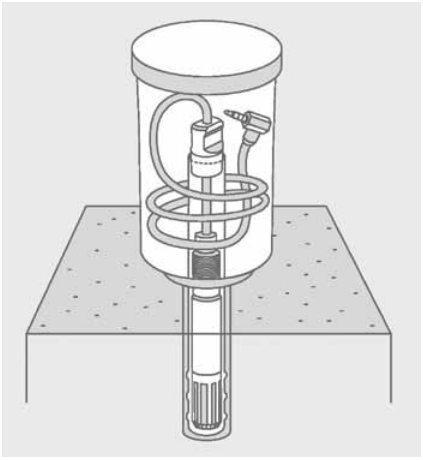
Additional accessories for the SHM40 can be used to prepare a moisture measurement hole in fresh concrete. Pre-formed holes eliminate the need for drilling and the risk of damaging heating elements or tubing embedded in the concrete.

Easy Measurement with Multiple HMP40S Probes and Quick Connectors

HMP40S measurement probes are interchangeable. The probes connect easily to the HM40 indicator with a snap-on connector enabling convenient use of multiple probes with one indicator. The measurement data can be displayed in numeric, statistic or graph views.

Features or Benefits

- Easy to use
- Truly interchangeable measurement probes
- Durable
- Accurate measurement data in numeric, statistic or graph views
- Conforms to ASTM standard F2170
- IP65 classified measurement probe and case



A borehole in concrete and a measurement probe HMP40S inserted in it.

Snapping a connector to the indicator HM40 to read the measurement results.

Standard Contents of SHM40

- HM40 indicator with adapter
- 1 piece HMP40S RH&T probe with a cable
- 12 pcs plastic tubes (19266HM)
- 12 pcs rubber plugs (233976)
- 3 pcs protective covers with lid (19268HM)
- NIST traceable certificate
- Weather-proof carrying case with a shoulder strap

Technical Data

HMP40S Probe

Relative Humidity

Measurement range	0 ... 100 %RH
Accuracy (incl. non-linearity, hysteresis, and repeatability):	
temperature range	0 °C ... +40 °C
0 ... 90 %RH	± 1.5 %RH
90 ... 100 %RH	± 2.5 %RH
temperature range	-40 °C...0 °C and +40 °C ... +80 °C
0 ... 90 %RH	± 3.0 %RH
90 ... 100 %RH	± 4.0 %RH
Factory calibration uncertainty at +20°C (68°F)	
0 ... 90 %RH	± 1.1 %RH
90 ... 100 %RH	± 1.8 %RH
Humidity sensor	HUMICAP® 180R
Stability	± 2 %RH over 2 years

Temperature

Measurement range	-40 °C ... +80 °C
Accuracy over temperature range:	
0 ... +40 °C	± 0.2 °C
-40 ... 0 °C, +40 ... +80 °C	± 0.4 °C
Temperature Sensor	Pt1000 RTD Class F0.1 IEC 60751

General

Operating temperature range for probe	-40 °C ... +80 °C
Probe weight with standard cable	31 g
Probe housing material	stainless steel
Probe filter and sensor protection	membrane filter with chrome coated ABS plastic
Cable material	Wire PVC / jacket PU
Cable connector	TRRS male 3.5 mm
Probe housing classification	IP65
Borehole diameter needed	16 mm
Measurement depth with standard accessories	min. 30 mm, max. 90 mm

HM40 Indicator

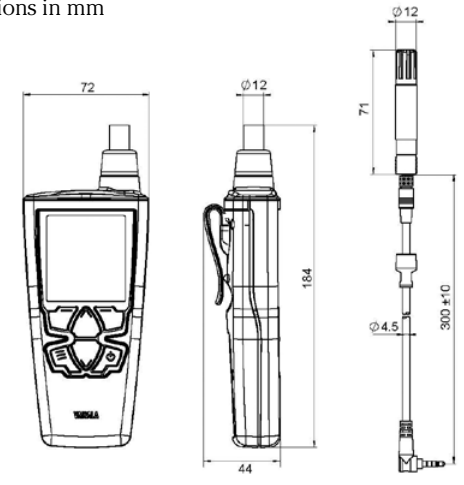
Operation temperature range for indicator	-10 ... +60 °C
Storage temperature range	-30 ... +70 °C
Weight	
Indicator with adapter	240 g
SHM40 case with standard content	3.7 kg
Indicator materials	PC/ABS blend, acrylic display lens
Indicator adapter materials	Nickel plated brass and plastic overmolding
Indicator housing classification	IP54
Mechanical drop endurance	1.0 m without the probe
Power-up time	< 3 s
Alkaline batteries	2 x AA sized, 1.5V (LR6)
Operation time (Alkaline batteries)	typical 100 hours (without backlight)
Calculated variables	Td, Tw, a, x, h
Menu languages	English, German, French, Finnish, Spanish, Swedish, Chinese (simplified), Russian, Japanese
Display	LCD (140 x 160 pixels)
Electromagnetic compatibility (EMC)	European Union directive EN61326-1 for portable equipment

Accessories and Spare Parts

HM40 indicator with adapter and cable probe	HM40S
RH&T probe with cable	HMP40S
HM40 indicator with adapter	HM40SINDI
Quick connection adapter	HM40SADAPTER
Cable for RH&T probe	HMP40SCABLE
Long cable (2.7 m) for RH&T probe	HMP40SCABLE2
Plastic tube set (12 pcs)	19266HM
Rubber plugs (12 pcs)	233976
Protective cover with lid (3 pcs)	19268HM
Weather-proof carrying case with SHM40 filling	233815
USB recharger for HM40 indicator batteries	229249SP
Plastic grid with membrane filter for HMP40S probe	DRW010525SP
ACCESSORIES FOR WET CONCRETE	
Plastic flange set (12 pcs)	26529HM
Long rubber plug for wet concrete (12 pcs)	26530HM

Dimensions

Dimensions in mm



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HMK15 Humidity Calibrator

three step plugs to fit all chamber holes (12 mm, 13.5 mm and 18.5 mm)
transit covers for secure transportation and long-term storage
thermometer with calibration certificate

In addition to laboratory use, Vaisala Humidity Calibrator HMK15 is suitable for on-site checks of humidity probes and transmitters.

Features/Benefits

- Easy and reliable calibration of humidity probes and transmitters
- Based on saturated salt solutions
- Fast temperature equilibration
- No external power required
- Suitable for laboratory use and on-site checks
- Chambers and transit covers make HMK15 easy to transport
- Pre-measured certified salts available
- Vaisala Service Centers offer accredited calibrations for humidity, temperature and barometric pressure.

No measuring instrument stays accurate by itself. It is essential that the functioning of an instrument is periodically checked against a reference. Vaisala has developed the Vaisala Humidity Calibrator HMK15 to make calibration and spot checking of humidity probes and transmitters easy and reliable.

Method Used by Leading Laboratories

The operating principle of the HMK15 is based on the fact that a saturated salt solution generates a certain relative humidity in the air above it. The reading of the humidity probe or transmitter can then be adjusted accordingly. Many leading laboratories use this generally accepted and reliable method to calibrate humidity instruments. Usually two or three different salt solutions are used. Salts are chosen according to the application.

Certified Salts

The HMK15 can be ordered with certified and pre-measured salts. A sample calibration is made from each batch in Vaisala's Measurement Standards Laboratory (MSL).

Calibrated Thermometer

The HMK15 can be ordered with a thermometer, which is used for measuring the temperature during the calibration. It can also be used for checking the temperature measurement accuracy of the transmitter. The thermometer can contain either mercury (accuracy ±0.3 °C (±0.54 °F)) or red capillary fluid (accuracy ±1.0 °C (±1.8 °F)).

FINAS Accredited Measurement Standards Laboratory

Vaisala's Measurement Standards Laboratory is a FINAS accredited calibration laboratory. FINAS is a member of the EA (the European Cooperation for Accreditation).

FINAS
Finnish Accreditation Service
K008 (EN ISO/IEC 17025)

Technical Data

General

The standard HMK15 consists of the following parts:

- Two salt chambers, chamber covers and transit covers
- Base plate
- Choice of thermometers
  - mercury thermometer, Vaisala calibrated, order code 19728HM
  - thermometer with red capillary liquid, calibrated by manufacturer, order code 25130HM
- Measurement cup and mixing spoon

Options

Certified and ready dosed salts:		Order code:	Total uncertainty*:
LiCl salt	11 %RH	19729HM	(±1.3 %RH)
$MgCl_2$ salt	33 %RH	19730HM	(±1.2 %RH)
NaCl salt	75 %RH	19731HM	(±1.5 %RH)
K_2SO_4 salt	97 %RH	19732HM	(±2.0 %RH)

*Uncertainties given at +20 °C

Ion exchanged water	19767HM
Extra salt chambers	19766HM
Carrying bag	HM27032

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HMP155 Humidity and Temperature Probe

HMP155 with an additional temperature probe and optional Stevenson screen installation kit.

Features/Benefits

- Vaisala HUMICAP®180R sensor - superior long-term stability
- Optional warmed humidity probe and chemical purge
- Plug-and-play
- USB connection for service use
- Fits with DTR13 and DTR503 radiation shields and also for a Stevenson screen
- Weather-proof housing IP66
- Optional, fast temperature probe
- Different output possibilities: voltage, RS-485, resistive Pt100
- Applications: meteorology, aviation and road weather, instrumentation

The Vaisala HUMICAP® Humidity and Temperature Probe HMP155 provides reliable humidity and temperature measurement. It is designed especially for demanding outdoor applications.

Long-term Stability

The HMP155 has the proven Vaisala HUMICAP®180R sensor that has excellent stability and withstands well harsh environments. The probe structure is solid and the sensor is protected by default with a sintered teflon filter, which gives maximum protection against liquid water, dust, and dirt.

Warmed Probe and High Humidity Environment

Measuring humidity reliably is challenging in environments where humidity is near saturation. Measurements may be corrupted by fog, mist, rain, and heavy dew. A wet probe may not give an accurate measurement in the ambient air. This is an environment to which Vaisala has designed a patented, warmed probe for reliable measuring. As the sensor head is warmed continuously, the humidity level inside it stays below the ambient level. Thus, it also reduces the risk of condensation forming on the probe.

Fast Measurements

With its fast response time, the additional temperature probe for the HMP155 is ideal for measurement in environments with changing temperatures. The new membrane filter speeds up the RH measurement.

Long Lifetime

Protecting the sensor from scattered and direct solar radiation, and precipitation will increase its lifetime. Thus, Vaisala recommends installing the HMP155 in one of the following radiation shields: DTR503, DTR13, or a Stevenson screen. For the additional temperature probe, an installation kit is available to be used with DTR502 radiation shield.

Easy Maintenance

The probe can be calibrated using a pc with a USB cable, with the push buttons, or with the MI70 indicator.

Technical Data

Performance

RELATIVE HUMIDITY

Measurement range	0 ... 100 %RH
Accuracy (incl. non-linearity, hysteresis and repeatability) at	
+15 ... +25 °C (+59 ... +77 °F)	±1 %RH (0 ... 90 %RH) ±1.7 %RH (90 ... 100 %RH)
-20 ... +40 °C (-4 ... 104 °F)	±(1.0 + 0.008 x reading) %RH
-40 ... -20 °C (-40 ... -4 °F)	±(1.2 + 0.012 x reading) %RH
+40 ... +60 °C (+104 ... +140 °F)	±(1.2 + 0.012 x reading) %RH
-60 ... -40 °C (-76 ... -40 °F)	±(1.4 + 0.032 x reading) %RH
Factory calibration uncertainty (+20 °C /+68 °F)	±0.6 %RH (0 ... 40 %RH)* ±1.0 %RH (40 ... 97 %RH)*

* Defined as ±2 standard deviation limits. Small variations possible, see also calibration certificate.

Recommended humidity sensor	HUMICAP®180R(C)
Response time at +20 °C in still air with a sintered PTFE filter	
63 %	20 s
90 %	60 s

TEMPERATURE

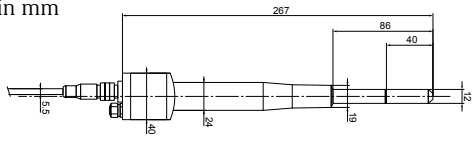
Measurement range	-80 ... +60 °C (-112 ... +140 °F)
Accuracy with voltage output at	
-80 ... +20 °C	±(0.226 - 0.0028 x temperature) °C
+20 ... +60 °C	±(0.055 + 0.0057 x temperature) °C
passive (resistive) output according to IEC 751 1/3 Class B	±(0.1 + 0.00167 x |temperature|)°C
RS485 output	
-80 ... +20 °C	±(0.176 - 0.0028 x temperature) °C
+20 ... +60 °C	±(0.07 + 0.0025 x temperature) °C
Accuracy over temperature range (opposite)	
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751
Response time with additional temperature probe in 3 m/s air flow	
63 %	<20 s
90 %	<35 s

OTHER VARIABLES

dew point/frost point temperature, wet bulb temperature, mixing ratio

Dimensions

Dimensions in mm



General

Operating temperature range	-80 ... +60 °C (-112 ... +140 °F)
Storage temperature range	-80 ... +60 °C (-112 ... +140 °F)
Connection	8-pin male M12 connector
Connection cables	3.5, 10, and 30 m
Cable material	PUR
Wire size	AWG26
Service cables	USB connection cable MI70 connection cable
Additional T probe cable length	2 m
Housing material	PC
Housing classification	IP66
Sensor protection	sintered PTFE optional membrane filter
Weight (probe)	86 g

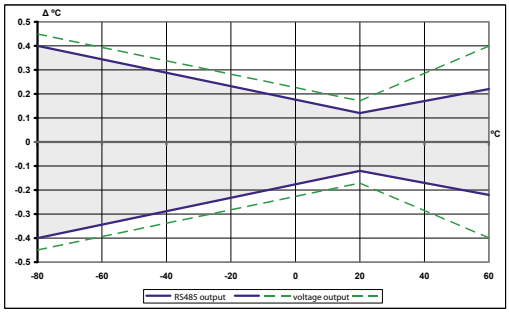
Electromagnetic compatibility: Complies with the EMC standard EN61326-1, Electrical equipment for measurement control and laboratory use - EMC requirement for use in industrial locations

Inputs and Outputs

Operating voltage	7 ... 28 VDC*

*Note: minimum operating voltage 12 V with 0 ... 5 V output and 16 V with 0 ... 10 V output, probe heating, chemical purge or XHEAT.

Outputs	
voltage output	0 ... 1 V, 0 ... 5 V, 0 ... 10 V
resistive Pt100 (4-wire connection)	
RS485	
Average current consumption (+15 VDC, load 100 kOhm)	
0 ... 1 V output	<3 mA
0 ... 10 V output	+0.5 mA
RS485	<4 mA
during chemical purge	max. 110 mA
with warmed probe	max. 150 mA
Settling time at power-up	
voltage output	2 s
RS485	3 s



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DTR500 Solar Radiation and Precipitation Shields

The Vaisala Solar Radiation Shield Series DTR500 are available in either a 5-, 9- or 12-plate models.

Features/Benefits

- Protects temperature and humidity probes from scattered, as well as, direct solar radiation and rain.
- Maintenance-free
- Naturally ventilated
- Installs easily on a vertical pole, horizontal beam or flat surface
- Suitable for a wide range of applications
- Choice of shields and mounting accessories

The Vaisala Radiation Shield Series DTR500 are solar radiation and precipitation shields supporting humidity probe installations in outdoor applications.

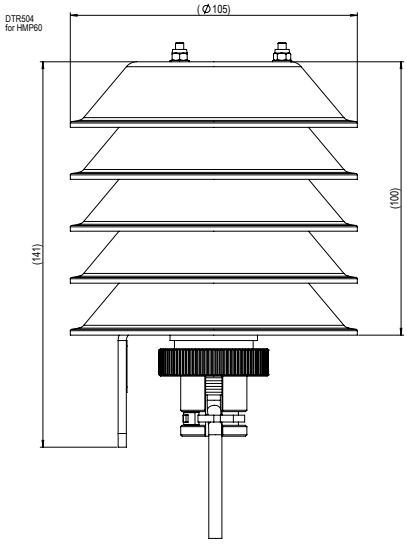
Shield Protects Sensor

The maintenance-free DTR500 series shields protect the humidity and temperature sensors from solar radiation and precipitation. They provide excellent ventilation while blocking both direct and reflected solar radiation.

The special plastic used in the plates has excellent thermal characteristics; the white outer surface reflects radiation; the black inside absorbs accumulated heat. The shields can be easily installed on either a vertical pole, horizontal beam, or a flat surface.

The DTR Shields can be used with the following Vaisala products:

- **DTR502(A)** with adapter 221072 for Vaisala HUMICAP® Humidity and Temperature Probe HMP155's additional temperature sensor
- **DTR502B** for Vaisala HUMICAP® Humidity and Temperature Transmitters HMT333, HMT337, HMT363 and HMT367 and Vaisala Combined Pressure, Humidity and Temperature Transmitters PTU303 and PTU307
- **DTR503(A)** for Vaisala HUMICAP® Humidity and Temperature Probe HMP155



DTR504 for HMP60, HMP110 and HMT120/130 remote probes. Refer to drawings of DTR502B for dimensions of DTR504A pole mast installation accessory.

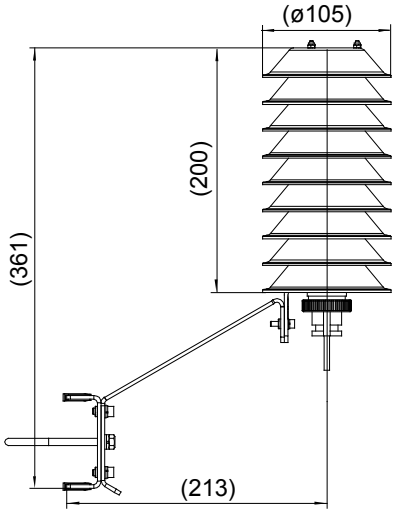
- **DTR503B** for Vaisala HUMICAP® Humidity and Temperature Transmitters HMD60/70
- **DTR504(A)** for Vaisala HUMICAP® Humidity and Temperature Transmitters HMT120/130, Vaisala HUMICAP® Humidity and Temperature Probe HMP110 and Vaisala INTERCAP® Humidity and Temperature Probe HMP60

Technical Data

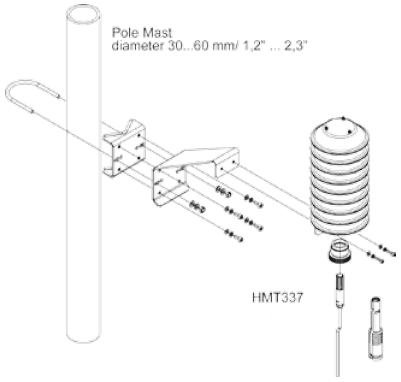
Dimensions

Dimensions in mm.

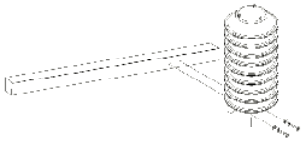
DTR502B
for HMT333, HMT337, HMT363, HMT367, PTU303 and PTU307



DTR502B pole mast installation.



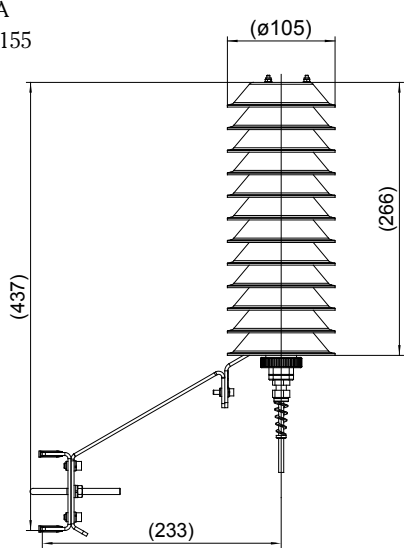
DTR502 horizontal beam installation.



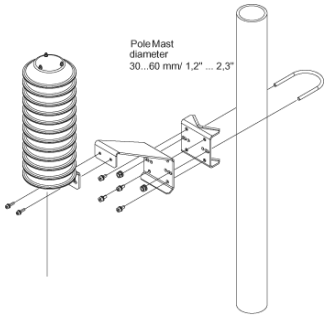
Dimensions

Dimensions in mm.

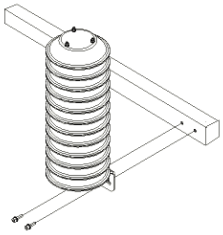
DTR503A
for HMP155



DTR503A pole mast installation.



DTR503 horizontal beam installation.



- DTR502/503/504 include only horizontal beam assembly
- DTR502A/503A/504A include also pole mast installation kit
- DTR502B/503B include also product specific adapter

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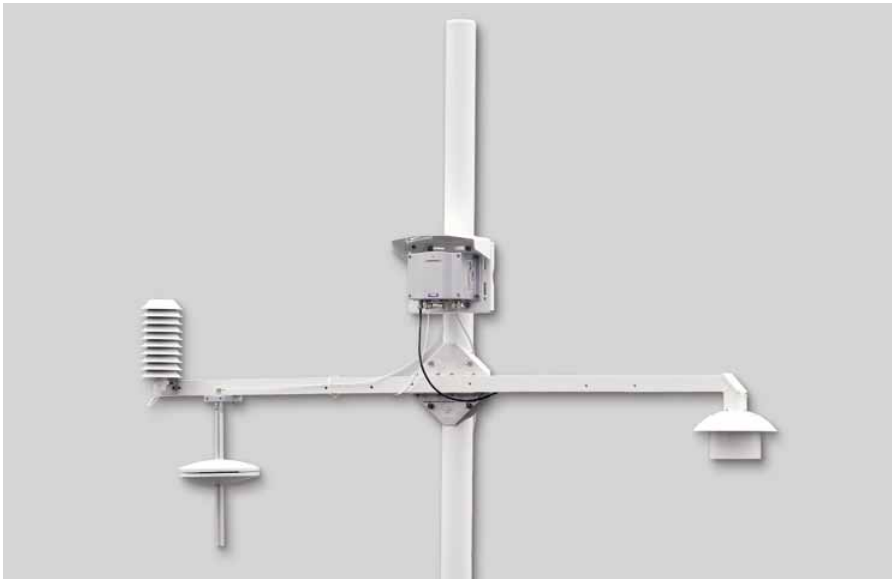
HMT330MIK Meteorological Installation Kit



The HMT337 and PTU307 feature warmed probe technology. Installed with the HMT330MIK kit either one forms the right choice for reliable humidity measurement in humid weather conditions.

Features/Benefits

- For outdoor humidity and temperature measurements
- Can be ordered in a variety of configurations
- Used together with HMT337 transmitter or PTU307
- Vaisala SPH 10/20 Static Pressure Head eliminates effectively pressure variations in the barometer caused by wind

HMT337/PTU307 Features

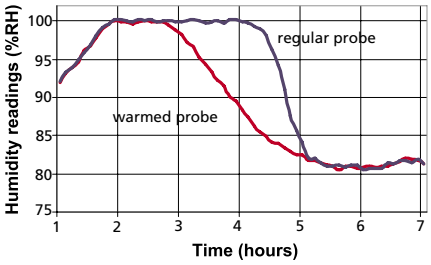
- Warmed probe provides true humidity readings in condensing conditions
- Humidity measurement expressed as relative humidity and/or dew point temperature
- Easy field calibration with the HM70 hand-held meter

The Vaisala Meteorological Installation Kit HMT330MIK enables the Vaisala HUMICAP® Humidity and Temperature Transmitter HMT337 to be installed outdoors to obtain reliable measurements for meteorological purposes.

True Humidity Readings in Condensing Conditions

In weather observations dew formation makes reliable humidity measurement difficult. When dew has formed on the humidity sensor, it is impossible to obtain a true reading until this dew evaporates.

Both the PTU307 and HMT337 avoid this problem by warming the probe. When warmed, the relative humidity inside the probe stays below the ambient level. With an accurate temperature measurement, the ambient dew point can be calculated precisely. To obtain the ambient relative humidity, an additional probe measures the ambient temperature,



After a period of 100 % relative humidity, the warmed probe measures the true humidity, whereas the non-warmed probe takes time to recover from the condensation.

and the transmitter calculates the relative humidity from the dew point and temperature values.

Open Shield Prevents Microclimates

The warmed probe of the HMT337/PTU307 is mounted in a shield which is open at the bottom to ensure steady air circulation to the sensor even in calm weather.

In traditional radiation shields sleet or snow can accumulate on the shield and prevent the proper air circulation through the shield, and create a humid microclimate until the snow melts.

Essential for Critical Weather Measurements

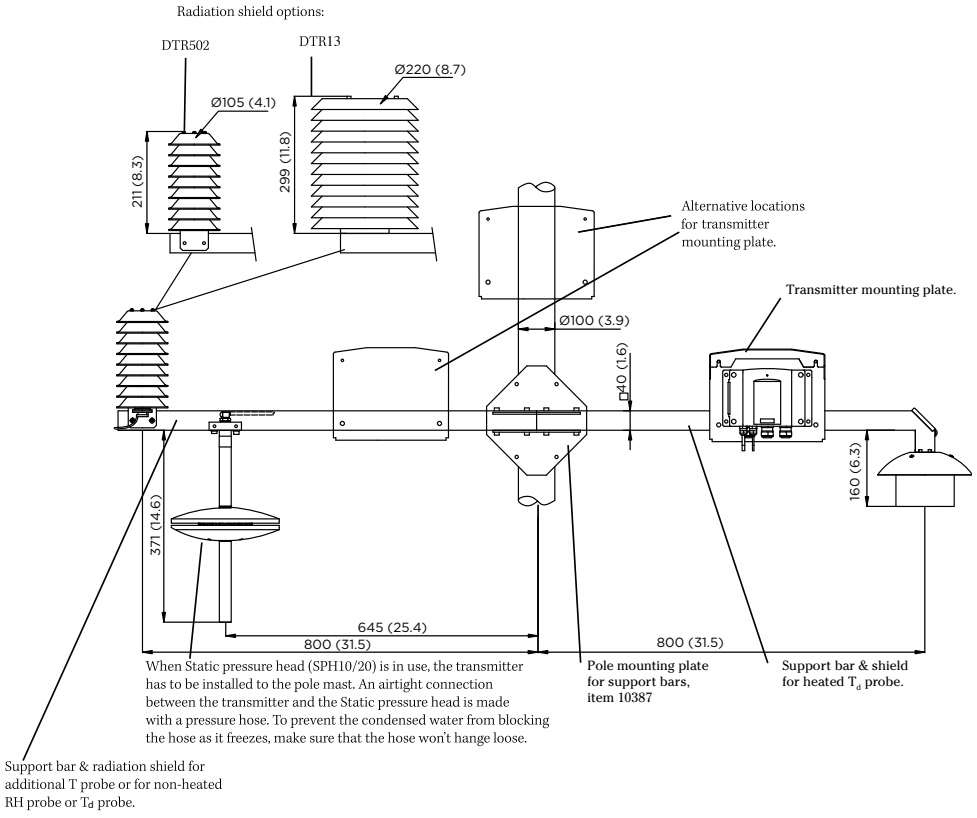
Obtaining a true humidity reading is particularly important e.g. in traffic safety: at airports and at sea as well as on the roads. It is essential, for example, in fog and frost prediction.

For calibration, a portable HMP77 reference probe is easy to attach beside the HMT337 or PTU307 probe.

Technical Data

Dimensions

Dimensions in mm (inches)


Radiation shield options:
DTR502
DTR13
Ø220 (8.7)
Ø105 (4.1)
211 (8.3)
299 (11.8)
Alternative locations for transmitter mounting plate.
Transmitter mounting plate.
Ø100 (3.9)
40 (1.6)
160 (6.3)
371 (14.6)
645 (25.4)
800 (31.5)
800 (31.5)
When Static pressure head (SPH10/20) is in use, the transmitter has to be installed to the pole mast. An airtight connection between the transmitter and the Static pressure head is made with a pressure hose. To prevent the condensed water from blocking the hose as it freezes, make sure that the hose won't hange loose.
Pole mounting plate for support bars, item 10387
Support bar & shield for heated T_d probe.
Support bar & radiation shield for additional T probe or for non-heated RH probe or T_d probe.

Order form

				1	2	3	4	5	
	Vaisala Meteorological Installation Kit		**HMT330MIK**						PRICE
1	Support bar & shield for warmed Td probe	**No support bar & shield for warmed Td probe**		**0**					
		Support bar & shield for warmed Td probe		*1*					
2	Support bar and radiation shield for additional T probe or for non-warmed RH or Td probe	**No support bar or radiation shield**			**A**				
		Support bar with DTR502 shield for T probe			*B*				
		Support bar with DTR13 shield for T probe			*C*				
		Support bar with DTR502 shield for non-warmed RH or Td probe			*D*				
		Support bar with DTR13 shield for non-warmed RH or Td probe			*E*				
3	Support bar mounting plate	**No mounting plate**				**0**			
		Pole mounting plate for support bar/bars (item 10387)				*1*			
4	Additional transmitter mounting plate (incl. rain shield)	**No additional transmitter mounting plate**					**A**		
		Transmitter mounting plate for support bar assembly					*B*		
		Transmitter mounting plate for pole assembly					*C*		
5	Static Pressure Head	**No Static Pressure Head**						**0**	
		Static Pressure Head SPH10	*Only for the PTU300*					*1*	
								TOTAL	
								QTY	
								TOTAL VALUE	

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HMT300TMK Turbine Mounting Kit for Power Turbine Intake Air Measurement

The Vaisala HUMICAP® Turbine Mounting Kit HMT300TMK is shown with the cover open and HMT337 Humidity and Temperature Transmitter installed. (Not included in the HMT300TMK.)

The Vaisala HUMICAP® Turbine Mounting Kit HMT300TMK is developed to monitor the air intake of gas and liquid fueled power turbines. HMT300TMK is used together with HMT337 Temperature and Humidity Transmitter.

Features/Benefits

- Designed for high humidity applications
- Measurement range: -40 ... +100°C
- Patented, warmed probe
- Incorporates Vaisala HUMICAP® Sensor for excellent accuracy and long-term stability and resistance to dust and most chemicals
- Low maintenance need
- Outer cover provides protection from rain and direct sunlight
- NIST traceable (certificate included)

It is ideal for measuring in water vapor injection applications because the sensor has been optimized for high humidity environments by utilizing a patented, warmed probe. Water vapor is added to the intake of the turbine to increase the mass flow which in turn increases compression and electrical power output.

Low Maintenance

Power turbines also require exact water vapor injection in the chamber to reduce pollutant emissions. Vaisala's warmed probe technology is ideal because of its reliability in the field. In fact, the only suggested scheduled maintenance is annual calibration.

Patented, Warmed Probe Prevents Condensation

The HMT300TMK with the HMT337 installed, provides fast and reliable dewpoint measurement especially under high humidity conditions where dew would normally form on the humidity sensor and thereby cause errors in measurement. The patented warmed probe prevents condensation from forming on the sensor.

Protective Enclosure

The HMT300TMK includes a white, painted stainless steel enclosure with an installation kit for the probe. The HMT337 Humidity and Temperature Transmitter is installed in the stainless steel enclosure at the factory, when ordered together with HMT300TMK. The instrument can be equipped to be powered with either 24 VDC/VAC or with an internal 110/230 volt power supply unit.

The outer cover protects the transmitter from direct sun light and rain. The installation kit protects the probe from outer water splashes, keeps the sensor dry, and prevents any parts that could vibrate loose from entering the turbine.

The HMT300TMK can be ordered separately for installation with the customer's existing HMT337.

HUMICAP® Performance

The HMT330 Series Transmitters are fitted with the latest generation of the HUMICAP®, the polymer sensor known for its accuracy, reliability and long-term stability. The sensor has a high tolerance for particulate abrasion and chemical contamination.

Vaisala HUMICAP® Humidity and Temperature Transmitter HMT337

The HMT337 is intended for demanding industrial humidity measurement applications with a risk of condensation. The stainless steel probe is mechanically durable and preferred for most industrial applications.